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Descripteur(s): *Activité physique *Réadaptation *Déficient mental *Handicapé physique *Handicapé visuel *Services aux handicapés *Anthologie

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Les objectifs généraux du symposium sont: 1. de réunir dans une même rencontre les divers spécialistes intéressés à l'activité physique adaptée sous la plupart de ses formes; 2. de promouvoir la valeur de l'activité physique adaptée comme facteur déterminant dans les sciences de la réadaptation; 3. d'offir aux participants un contenu scientifique et professionnel en activité physique adaptée. Le premier tome des Actes présente huit textes de séminaires thématiques relatifs aux déficients mentaux, perceptuels et morphologiques, ainsi que les conférences de deux ministres québécois et du délégué de l'Organisation mondiale de la santé.

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ACTES/PROCEEDINGS

INTERNATIONAL SYMPOSIUM INTERNATIONAL

ACTIVITE PHYSIQUE ADAPTEE
CLEF DU PROCESSUS DE LA READAPTATION

ADAPTED PHYSICAL ACTIVITY
KEY TO THE REHABILITATION PROCESS

17-18-19 mars 1977
CHATEAU FRONTENAC
QUEBEC, CANADA

Préface / Preface

Le secteur activité physique adaptée, partie intégrante des sciences de l'activité physique, joue un rôle de plus en plus important dans le processus de réadaptation de populations spéciales.

Graduellement l'improvisation a fait place à différentes méthodes spécifiques, propres à améliorer et à accélérer le processus de normalisation de l'individu.

Actuellement, l'activité physique est utilisée par différents spécialistes de la réadaptation comme moyen de normalisation ou de développement physique et/ou mental. Toutefois, il est essentiel que les buts de l'activité physique soient définis avec précision, élargis et divulgués de façon scientifique et professionnelle.

Les objectifs généraux du symposium étaient:
-de réunir dans une même rencontre les divers spécialistes intéressés à l'activité physique adaptée sous la plupart de ses formes;
-de promouvoir la valeur de l'activité physique adaptée comme facteur déterminant dans les sciences de la réadaptation;
-d'offrir aux participants un contenu scientifique et professionnel en activité physique adaptée.

Les populations spéciales visées incluaient les handicapés morphologiques, mentaux, organiques, perceptuels, émotifs tout aussi bien que celles commençant à être affectées par les troubles de l'âge.

The field of physical activity for the handicapped, an integral part of the sciences of physical activity, is playing an ever more important role in the process of rehabilitating special populations.

Gradually, improvisation is being superseded by different specific methods designed to improve and accelerate the normalization of the individual.

At the present time, physical activity is being utilized by various rehabilitation specialists as an instrument to normalize or to promote physical and/or mental development. However, it is essential that the aims of physical activity for the handicapped be defined precisely, broadened and publicized in a scientific and professional manner.

The general objectives of the Symposium were:
-to bring together in a single event the different specialists interested in adaptive physical activity in most of its principal forms;
-to promote the value of physical activity as a pertinent and influential factor in the rehabilitation sciences;
-to offer participants scientific and professional content on physical activity for the handicapped.

The special populations contemplated included those manifesting orthopedic, mental, organic, perceptual, and emotional handicaps, as well as those beginning to suffer from the burdens of age.

Six des séminaires thématiques gravitèrent autour de ces populations spéciales, un dernier s'occupa des problèmes de la formation professionnelle. De plus, différentes communications scientifiques et professionnelles furent présentées par quelque 30 conférenciers.

Trois événements se déroulaient simultanément, à l'exception du samedi après-midi où l'on visionna quelques films et où fut organisé une visite au Centre de Réadaptation du Québec.

Rehaussèrent la qualité de ces rencontres, les allocutions des ministres du Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports, des Affaires Sociales, des représentants du ministère de l'Education du Québec et de l'Organisation Mondiale de la Santé.

Environ 300 personnes d'une dizaine de pays prirent part à ces assises.

Les textes présentés dans les trois tomes ont été révisés par le comité d'édition. Afin d'assurer l'uniformité dans la présentation, la procédure uniforme adoptée fut celle suggérée par l'Association Américaine de Psychologie.*

Le comité d'édition

*American Psychological Association. *Publication Manual* (2nd ed.). Washington, D.C.: The Association, 1975, 137 pp.

Six of the thematic seminars focused on these special populations, and another centered on the problems of professional training. Furthermore, scientific and professional communications were presented by some 30 speakers.

Three functions occurred simultaneously, except Saturday afternoon, when films were shown and an opportunity was provided to visit the Quebec Rehabilitation Center.

The quality of the meetings was greatly enhanced by the addresses by the Ministers of the Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports, of the Affaires Sociales, and by representatives of the ministère de l'Education du Québec and of the World Health Organization.

About 300 individuals from a dozen countries participated in the conferences.

All the texts presented in the three volumes were revised by the Editorial Committee. To guarantee uniformity it was decided to follow the norms suggested by the American Psychological Association.*

The Editorial Committee

*American Psychological Association. *Publication Manual* (2nd ed.). Washington, D.C.: The Association, 1975, 137 pp.

Remerciements / Acknowledgment

Le premier symposium international en activité physique adaptée, qui s'est déroulé au Château Frontenac du 17 au 19 mars 1977, n'aurait jamais eu lieu sans les hauts patronages de l'Organisation Mondiale de la Santé, du ministère de la Santé Nationale et du Bien-Etre Social du Canada, des ministères des Affaires Intergouvernementales, des Affaires Sociales, de l'Education, du Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports du Québec et de la précieuse collaboration des départements d'éducation physique des universités d'Ottawa, de Sherbrooke, de Montréal, du Québec à Montréal, du Québec à Trois-Rivières.

Sincères remerciements à monsieur Louis De G. Page et au Centre de Réadaptation du Québec, pour les services de secrétariat.

Notre reconnaissance également va à messieurs René Bolduc, Louis W. Jankowski, Claude H. Nadeau, William A. R. Orban et Donald Royer, membres de la commission scientifique et aux collaborateurs, madame Madeleine Clément, messieurs Georges Larivière, André Goulet, Claude Morin, Alain Ross, Jacques Abeele, Léandre Cloutier, Jean Jobin, Pierre Lagassé, Yvan Leduc, Pierre Potvin et Charles Thiffault.

Le comité d'édition

The first international symposium on physical activity for the handicapped took place at the Chateau Frontenac in Quebec City, from the 17th to the 19th of March, 1977. It could never have been held without the distinguished patronage of the World Health Organization, the Ministry of National Health and Social Welfare of Canada, les ministères des Affaires Intergouvernementales, des Affaires Sociales, de l'Education, du Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports du Québec and also without the valuable cooperation of the following Departments of Physical Education at the universities of Ottawa, Sherbrooke, Montreal, du Québec à Montréal, du Québec à Trois-Rivières.

Sincere expressions of appreciation are due to Mr. Louis De G. Page and to the Quebec Rehabilitation Center for providing secretarial services.

Furthermore, our gratitude goes out to Messrs René Bolduc, Louis W. Jankowski, Claude H. Nadeau, William A. R. Orban, and Donald Royer, members of the Scientific Committee, and to collaborators, Mrs. Madeleine Clément, Messrs Georges Larivière, André Goulet, Claude Morin, Alain Ross, Jacques Abeele, Léandre Cloutier, Jean Jobin, Pierre Lagassé, Yvan Leduc, Pierre Potvin and Charles Thiffault.

The Editorial Committee

Introduction / Introduction

Seuls ont été retenus les textes des séminaires thématiques relatifs aux déficients mentaux, perceptuels, morphologiques. De plus, sont présentées en annexe, les conférences de messieurs Claude Charron, ministre délégué au Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports, Denis Lazure, ministre des Affaires Sociales, Robin Hindley Smith, délégué de l'Organisation Mondiale de la Santé.

Quant aux autres textes, leur absence ou leur non-conformité aux critères exigés a empêché de les publier dans le cadre de ces Actes. Nous le regrettons au nom de tous les intéressés.

Le comité d'édition

Have been solely retained the thematic seminar texts relative to the mentally, perceptually, orthopedically handicapped. Furthermore, are presented in annex, the addresses of Messrs Claude Charron, ministre délégué au Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports, Denis Lazure, ministre des Affaires Sociales, and of Mr. Robin Hindley Smith, delegate of the World Health Organization.

All the other texts, those not duly received in time, those in non-conformity with the established criteria prevented us from publishing them in these Proceedings. We regret for all those interested.

The Editorial Committee

TABLE DES MATIERES/TABLE OF CONTENT

TOME 1

Conférences thématiques/Seminar presentations

PREFACE/PREFACE i

REMERCIEMENTS/ACKNOWLEDGEMENT iii

INTRODUCTION/INTRODUCTION iv

ACTIVITE PHYSIQUE ADAPTEE CHEZ LES DEFICIENTS MENTAUX/
ADAPTED PHYSICAL ACTIVITY TO THE MENTALLY DEFICIENCIES 1

Stein, J. U.
Physical education, recreation, and sports for special populations 2

Watkinson, J., et Wall, A. E.
The PREP Program: A preschool play program for moderately mentally retarded children 25

Benoît, E. P.
Fondement de l'éducation psychomotrice du déficient mental: Une adaptation de la théorie de Hebb 45

ACTIVITE PHYSIQUE ADAPTEE CHEZ LES DEFICIENTS ORGANIQUES/
ADAPTED PHYSICAL ACTIVITY TO THE ORGANIC DEFICIENCIES 58

Métivier, G.
The role of physical activity in the treatment of diabetes 59

Yuhasz, M. S.
Obesity and exercise 68

ACTIVITE PHYSIQUE ADAPTEE CHEZ LES DEFICIENTS PERCEPTUELS/
ADAPTED PHYSICAL ACTIVITY TO THE PERCEPTUAL DEFICIENCIES 75

Roy, E. A.
Disturbances to limb praxis: A new look 76

Jones, B.
Implications for rehabilitation of psychological research on spatial perception in the blind 111

Allen, M. O.
Intersecting links: The brain, vestibular mechanisms, and learning 126

ANNEXE I: Conférence de monsieur Claude Charron, ministre délégué au Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports, Gouvernement du Québec.

ANNEXE II: Conférence de monsieur Denis Lazure, ministre des Affaires Sociales, Gouvernement du Québec

ANNEXE III: Conférence de monsieur Robin Hindley Smith de l'Organisation Mondiale de la Santé.

ACTIVITE PHYSIQUE ADAPTEE CHEZ LES DEFICIENTS MENTAUX / ADAPTED PHYSICAL ACTIVITY TO THE MENTALLY DEFICIENCIES

Physical education, recreation, and sports for special populations

Julian U. Stein
American Alliance for Health, Physical Education and Recreation
Washington, D.C.

Aims and objectives

At the present time two diametrically opposite trends are in obvious conflict relative to physical education, recreation, sport, and related activity areas for impaired, disabled, and handicapped persons. On the one hand are advocates of integrating or mainstreaming persons with various handicapping conditions into regular school and community programs (Information and Research Utilization Center, 1975). On the other hand are individuals and groups who want to maintain separate and special programs in whatever activities special populations participate (Journal of Physical Education and Recreation, 1976). Neither legislation nor litigation mandating placement of and programing for all individuals, regardless of type or severity of handicapping condition, in least restrictive environments, intend or imply abolition of special programs; nor do they mean indiscriminately placing individuals in regular programs for which participants are not prepared.

In essence, the definition of adapted physical education, in existence for almost a quarter century, expresses purposes and provides basic guidelines for all programs and activities involving special populations. It is interesting to note that in redefining special education West Virginia and Pennsylvania have recently incorporated the same principles found in the following definition of adapted physical education:

> A diversified program of developmental activities, games, sports, and rhythms suited to the interests, capacities, and limitations of students with disabilities who may not safely or successfully engage in unrestricted participation in the vigorous activities of the general physical education program. (Journal of the American Association for Health, Physical Education, and Recreation, 1952)

Specifically, special provisions are necessary for any individual who cannot safely or successfully participate in unrestricted activities of general or regular programs. In addition to encouraging administrative and organizational flexibility so that individuals can participate in regular programs when possible and special activities where necessary, services are based on need and not generalizations from categorical conditions. All menbers of a student body become eligible for needed services.

Basic aims and objectives of adapted physical education are no different than for physical education in any setting or for any student. Included are development and improvement of: (a) self-realization; (b) human relationships; (c) civic responsibility; (d) economic efficiency (Educational Policy Commission, 1937).

Specific elements of adapted physical education include (American Association for Health, Physical Education, and Recreation, 1973, pp. 3-4):

1. Corrective. Remediate conditions such as postural deficiencies and minor orthopedic deviations through individually planned exercise and activity programs.

2. Therapeutic. Provide individual prescriptions of movement activity for various purposes and to meet specific needs.

3. Remedial. Change or improve function or structure by means of selected exercises and/or physical/motor activities.

4. Adapted. Modify sports and games so impaired, disabled, and handicapped persons can participate, and/or provide means for each person to develop sufficient skills in various activities so as to be able to participate with his peers, classmates, and contemporaries.

5. Developmental. Increase exercise tolerance of the weak and ill through individually planned and progressively vigorous programs; more recently this has referred to preventing or improving low levels of motor ability or poor physical fitness in preschool and primary level children.

6. Special. Provide for the specific needs and abilities of special populations through corrective, developmental, therapeutic, remedial, or adapted activities.

Physical and motor activities are being used for a variety of remedial and therapeutic purposes in programs throughout the country.

Many of these same physical and motor activities are also being used in preventive programs especially in infant stimulation, early childhood, and parent intervention projects. Despite successes of many of these programs, research results, empirical evidence, and subjective observations differ as to exact and conclusive cause and effect relationships for noted progress. Research is needed to shed definitive light on this conflicting evidence.

By definition, therapeutic recreation is closely allied to education. As defined by the National Therapeutic Recreation Society, therapeutic recreation is "purposive intervention in some physical, emotional, and/or social behavior to bring about a desired change in that behavior and to promote the growth and development of the individual.(American Association for Health, Physical Education, and Recreation, 1973, p. 5)[1]

Structure, organization, administration

A great deal of autonomy is given organizations, agencies, and institutions in planning and implementing physical education, sport, or recreation programs for special populations. However, at the present time several types of legislation affect and influence opportunities in these areas for special populations.

1. Federal legistation just enacted[2] includes instruction in physical education within the definition of required special education services.

2. Recreation is considered a related service area. Implementation of this legislative mandate at state and local levels requires that physical education and recreation be included, if state plans are to be in compliance with the law and states receive allocated funds. Other federal programs have given direct sanction and support for programs in these areas, through funds specifically appropriated for personnel preparation (training) and innovation and development (research and demonstration) projects and activities in physical education and/or recreation involving impaired, disabled, and handicapped persons. In addition, projects dealing directly or having components in these areas

have been supported by other federal programs (i.e., Land and Water Conservation Act, National Institute of Mental Health).

In general, direct federal support for these areas is not as great as in many other countries of the world.

State Legislation governs most school and related educational programs and activities for all children including impaired, disabled, and handicapped youngsters. Until only recently not all impaired, disabled, and handicapped children were afforded legal-legislative equality of opportunities with their non-involved peers. This was true in all aspects of education including physical education; many state laws, regulations, and mandates were given dual interpretation (one for regular education, the other for special education). As a result, many special education youngsters were categorically denied opportunities in physical education, sports, and related activity areas. Some states have stipulated that equality of opportunity includes nonacademic areas such as physical education, sports, leisure activities, music, dramatics, art, home economics, industrial arts. Intent is the same in states where mandates are not as specific or as well clarified. At both state and local levels some Elementary and Secondary Education ACT (ESEA) projects (Titles I, III and VI) have dealt in toto or in part with physical education, motor development, leisure-time experiences, camping, outdoor education, and other activity modalities for children in special education programs.

Unfortunately legislation does not automatically bring about change or intended results. Therefore, litigation has been necessary in many states. A series of cases assures rights of certain stipulated minority groups. Specifically guaranteed for impaired, disabled, and handicapped persons are right to education, right to treatment, and right to community services. Direct and indirect implications for applications to physical education, recreation, sports, and related activity areas are implicit and explicit. Right to due process and equal protection of the law under the United States Constitution furthers the cause of equal rights and guarantees opportunities in all areas for special populations. Citizen and consumer advocacy are other factors stimulating programs, activities, and opportunities in these areas.

One of the most influential forces resulting in increased programing in these areas is greater recognition of their values and contributions to a higher quality of life for participants. Many different groups sponsor, support, and conduct a variety of physical education, recreation, and sport programs for special populations. For example:

1. Public and private schools, residential facilities, day care and activity centers, early childhood groups, park and recreation departments, civic and service groups, colleges and universities, professional associations, volunteer and private agencies, and commercial enterprises all are involved in programs and activities in these areas.

2. Physical education, adapted physical education, recreation, therapeutic recreation, camp, outdoor education, swimming, aquatics, sports, perceptual-motor are but a sampling of types of programs sponsored by groups listed above.

In general, many programs tend to be organized and function for participants with one type of handicapping condition. Some very successful programs have cut across handicapping conditions and have served two or more different conditions. Still other programs have integrated special populations with non-involved participants; others have the abled bodied as a minority with special groups as the majority. An approach that has been successful in a number of places provides flexibility in placement. Key to success in this approach is the ability of each individual to participate safely, successfully, and with personal satisfaction in the current activity. Basically a three step or level approach is suggested.

Regular programs. Individuals who can take part in regular activities safely, successfully, and with personal satisfaction should be guided and encouraged to participate in regular and community programs where they participate with peers and classmates.

Half-way house or intermediate type programs. Many individuals have the potential to take part eventually in regular programs but for the immediate present cannot. Something is lacking: confidence, experience, skills, emotional stability, social awareness, intellectual ability, physical condition, overall control. The half-way house approach served to help the individual overcome such problems.

Special programs. Some individuals have severe, profound, and multiple conditions so that they need long-range opportunities and experiences in special, segregated, or sheltered programs. Individuals in this group should not be considered permanently confined to special programs and activities to consider such an approach is inconsistent with the concepts advocated throughout this presentation (Journal of Health, Physical Education and Recreation, 1971). In too many instances readiness of other participants and personnel involved in these programs or activities have not been considered when planning appropriate placement for impaired, disabled, or handicapped individuals.

Curriculum

Much debate rages about curricula for physical education, recreation, and sports programs for special populations. Despite emphasis on individualized programs, many people still search for one program, single activity, or lone approach that will be everything to everybody. Others seek specific or special programs for persons with a given handicapping condition. The most successful programs recognize the individuality of participants and leaders and are approached in terms of basic interests, abilities, and hand-ups of people involved in these programs. Existence of specific or special body of knowledge in physical education and/or recreation for most special groups is questioned.

While modifications and adaptations in methods and techniques are obviously necessary for some participants, basic activities, sequences, and progressions are the same as those found in solid developmental programs. In fact, many advances in regular elementary school physical education programs have emerged from programs, activities, and methods designed to meet specific needs of mentally retarded, learning disabled, and other mildly impaired youngsters. Even in highly competitive sports, differences from the basic sport are kept at a minimum.

Regardless of the handicapping condition, somewhere individuals with that condition participate in virtually every physical education, recreation, and sport activity (Information and Research Utilization

Center, 1973). For example:

1. Visually impaired ski cross country and downhill, participate in gymnastics, play golf, skin and scuba dive, wrestle, climb the highest mountains, and run in competitions such as the Boston Marathon.

2. Amputees, paraplegics, and quadriplegics ski, swim, fish, dive, surf, and take part in gymnastics, pool, archery, hockey, weight lifting, football, karate, basketball, golf, table tennis, track and field.

3. Bedfast individuals dance, take part in dramatic production, work with clay, paint, attend parties.

While many planners of programs and providers of services continue to think of day or residential camping as the ultimate, others personally are challenging the most severely, profoundly, and multiply involved with backpacking, wilderness and survival camping, caving, orienteering, and Outward Bound challenge courses. Aquatic activity is not limited to instructional or recreational swimming but includes small craft, boating, white water canoeing, water skiing, surfing, sailing, skin and scuba diving, hydroplaning as well as fishing and casting. Programs are not limited to summer or warm weather. Year round programs continue in the severest of winter environments with skiing, snow shoeing, tobogganing, ice skating, sliding, sleigh riding, snow mobiling, snow picnics, and ice fishing.

Keys to success in these approaches are active involvement by each participant in activities that are relevant and challenging to him/her. Success, achievement, and personal satisfaction from meeting individual challenges are vital to the success of these programs. Personnel involved in these successful programs have not been affected by limited expectations of what individuals can and cannot do based on categorical generalizations.

Methods and evaluation

Because of the variety in personnel and diversity in programs and activities in which impaired, disabled, and handicapped persons participate, specific methods, techniques, and procedures differ widely. As with activities, many professionals continue to seek one way, a single approach, or a magic formula to guarantee success with all individuals having a specific condition. This approach fails to recognize the basic fact that we as individuals are dealing with individuals. As such, many different methods can be and are effective in teaching the same skills, movements, patterns, and activities to individuals with very similar external behavioral characteristics.

Many of the simplest, easiest, and most practical adaptation and modifications have been devised by impaired and disabled individuals for themselves. This is still further indication that more active involvement of consumers is necessary to meet their needs in most effective and efficient ways. Another factor that makes it difficult, if not impossible to standardize methods, approaches, and techniques, is that these populations defy standardization; they are not robots off an assembly line but real live flesh and blood with much personal worth and dignity.

These same factors create problems in evaluating individual progress. So often emphasis is placed on norms and standard scores rather than individual performance and progress. Many evaluation scales, assessment devices, and diagnostic tools are available and used in these programs. Appraisal is made of performance, achievement, and progress in many different areas (American Alliance for Health, Physical Education, and Recreation, 1975); (a) physical fitness, (b) motor, psychomotor, perceptual-motor development, (c) developmental profiles, (d) emotional stability, (e) social awareness, (f) sports skills.

Assessment is made in these and other areas for many different reasons. While many programs abuse rather than use evaluative devices, in the final analysis their justification is primarily in ways each facilitates instruction. With judicious use, results from a number of these devices can be used effectively to motivate participants. Several programs have been devised and are widely used for this purpose. The AAHPER/Joseph P. Kennedy Jr. Foundation Special Fitness Test (American Association for Health, Physical Education, and Recreation, 1968) and Motor Fitness Testing Manual for the Moderately Mentally Retarded are specific examples of such devices. Many swimming programs have included combination testing and award programs (Council for National Cooperation in Aquatics, 1969).

Precise cause and effect relationships continue to elude many people involved in these programs. Reasons for success of specific activities and approaches are generalized in terms of inappropriate, inaccurate, or inconclusive cause and effect relationships. Regardless of specific activities or methods found in successful programs, certain basic are consistently found in them: (a) participants are actively involved; (b) activities and methods are relevant, appropriate, and challenging; (c) results provide a feeling of personal satisfaction, achievement, and fulfillment; (d) participant and leader build a very special type of interpersonal relationship that inspires mutual confidence and trust in each other.

A hierarchy which can be applied and seen in virtually any sequence or progression of methods includes (Council for National Cooperation in Aquatics, 1969, pp. 42-43):

1. Coaction feel general or specific movement patterns by placing hands on parts of the body of an individual, mannequin, or doll going through desired movement patterns.

2. Manual manipulation guide parts of body through desired movement to bring about a proper response. This gives the participant the feel of the action and can do much to alleviate the initial fear so often shown by physically impaired or mentally retarded individuals to a new skill or activity.

3. Tactile touch body parts so the participant feels parts to be moved. Touching the arm to be moved or the leg to be kicked are simple examples of application. This is seldom if ever used by itself, but is a means of reinforcing visual and/or verbal stimuli.

4. Visual stimulus give the participant oral instructions, commands, or problems to solve. Delete, stimulate ears through the spoken work.

5. Abstract stimulus use various stimuli; signals, signs, words, numbers, colors, drum beats, or other signals. The participant receives, interprets, and translates into action the stimuli.

Personnel

Debate continues to rage in this country regarding roles of physical educators, recreation specialists, and coaches as related to special populations. At the present time certification is virtually nonexistant. Specifically:

1. Only one state has a special certification requirement in this area and that for remedial physical education instructors for physically impaired minors. Identification of competencies is very weak, and virtually nonexistent in regulations governing programs in this state (Dexter, 1973).

2. Several states have a dual certification in which teachers working in physical education programs with special education students must be qualified in both subject areas or disciplines.

3. Several states require personnel working in physical education programs with special education students to be certified only in special education.

4. About one-fourth of states do require a basic adapted physical education course for certification of all physical education teachers (Information and Research Utilization Center, 1974, p. 13). Additional states (i.e., Wisconsin, Missouri, Illinois, Kansas) are exploring specific certification in adapted physical education. This has been identified on several occasions by the Information and Research Utilization Center in Physical Education and Recreation for the Handicapped as an area in need of immediate attention.

5. Many states maintain some control of therapeutic recreation personnel through state civil service requirements.

6. The National Therapeutic Recreation Society[3] maintains a program of voluntary registration of personnel; six levels or categories are included in the program.

7. The American Corrective Therapy Association[4] does maintain a rigid certification program, including examination, for its members; this too is a voluntary program.

Increasingly paraprofessional personnel and those from other discipline (i.e., occupational therapy, physical therapy, dance therapy, art therapy, music therapy, horticulture therapy, activity/adjunctive therapy) are becoming actively involved in education, training, habilitation, and rehabilitation programs focusing on physical and/or recreational activities. Clear identification of specific function and role of personnel from each of these specializations is urgently needed.

For the last year representatives of professional associations representing most of these disciplines have been meeting periodically to deal with role identification, overlapping functions, and duplication of effort. Liaison, coordination, and cooperation among these groups are desired outcomes from these meetings.

In some states personnel from these fields can work directly in school programs without being certified as teachers as long as criteria of their own professional associations are met.

New and evolving roles of personnel directly involved in physical education, recreation, and sports for special populations need reevaluation and redefining. In addition to teacher-specialists in corrective/therapeutic/remedial, adapted, and developmental physical education, special resource personnel are needed to work with regular physical education, and classroom teachers as well as with special education personnel. Special supervisory personnel need to be consulted at all levels; state as well as local. College/university and research personnel in these areas need to come from individuals with appropriate and significant background and experience in these areas. Too many personnel preparing teachers and leaders and conducting research have not had sufficient first hand practical experience in the field to provide meaningful and relevant experiences for their students and to conduct studies zeroing in on real needs and applicable for live situations.

Patterns and problems are little different in recreation than in physical education. Many community recreation personnel are reluctant to consider therapeutic recreation personnel since program emphasis is desired in recreation and not therapy. This concern is further confirmed by statements from many participants who say the same thing regarding recreation and therapy. Despite attempts to change directions, many people still look upon therapeutic recreation as a service limited to hospitals, clinics, residential facilities, and related centers.

Basically, two simple questions need to be asked regarding requisite competencies to work with special populations in any of these areas:

1. What competencies, including knowledges, skills, appreciations, and attitudes, are necessary to be an effective physical educator, recreation specialist, coach, aquatic instructor, camp counselor, special educator?

2. What competencies above and beyond those listed above are needed to work with special populations in each of these areas and related areas?

Professional preparation

Level and type of professional preparation for these areas bring little basic agreement. Some personnel feel specialization is appropriate at the undergraduate level; others feel that specialization should be reserved for graduate levels and built upon a solid undergraduate foundation. A career ladder is advocated by others with each step leading to and interlocking with ones below and above.

While some few colleges and universities provided graduate opportunities in one or more of these areas, the advent of federal funds brought about an increase in the number of involved institutions. Most funded programs are at graduate levels and emphasize training high level college/university leadership personnel. Most who graduate from these programs go to college/university supervisory or administrative positions.

At least one of these programs has concentrated on training personnel at the junior or community college level. Other institutions at this level have developed aide, technician, or paraprofessional training programs on their own; still others are exploring possibilities in these areas.

With increasing emphasis on mainstreaming, more consideration has to be given basic understandings and appreciations of regular physical education and community recreation personnel. Some states already require a general survey course dealing with exceptional children for all teachers, counselors, administrators, and supervisors. This is an experience that should be required of all physical education and recreation majors regardless of their direction or area of specialization. In addition, a basic course in diagnosis of motor/physical problems and prescription of appropriate remedial activities (adapted physical education) should be required of all physical education majors; a similar experience is needed by recreation majors. Direct first hand experience is important with each of these requirements, a portion of practice teaching, internship, practicuum, or other field experiences should also be spent in working with special populations. The benefits of such an approach will be more understanding, sensitive, and more competent teachers/leaders. With other competencies required to attain a solid foundation in the basic area, this approach will enable generalists to deal with minor problems in regular programs. They will develop appreciation, understanding, and empathy, along with sensitivity to unique abilities and disabilities of each participant. They will know who to refer to whom when necessary. This will provide a sound base on which to build a graduate specialization.

Personnel already in the field have had opportunities to participate in many different kinds of in service programs.

Types. Conferences, conventions, meetings, workshops, clinics, institutes, seminars, orientation sessions.

Duration. Part of a day to several weeks or months.

Sponsors. Colleges/universities, school systems, individual schools, residential facilities, day care centers, mobile units, private agencies, parent/volunteer groups, professional associations. federal/state/local governmental departments, special projects, foundations, camps.

In general, few professional physical educators or recreation personnel have been actively involved in sports programs for special populations. While some increase in the last two or three years has been noted, insufficient attention has been given to this area in most professional preparation programs. Many general in service programs have done little more. As a result most special sports programs have grown through efforts of specific groups which sponsor, organize, administer, and supervise these programs (Information and Research Utilization Center, 1973). Some of these groups hold coaching clinics in activities they sponsor. This is an area not only in need of greater professional attention but more active involvement of impaired and disabled persons in leadership positions. Areas with implications for professional preparation programing include: (a) greater numbers of physically impaired participate in public school and community recreation programs; (b) larger numbers of severely and profoundly mentally retarded and multiple impaired persons becoming the responsibility of public school and community recreation personnel; (c) emphasis on infant stimulation, early childhood, and parent intervention programs; (d) possible mandate for certified athletic trainers in all schools participating in athletic programs.

Facilities and equipment

Architectural barriers, despite federal, state, and some local legislation requiring that all facilities be accessible, and attitudes of many people toward special facility and equipment needs are among greatest and most pressing problems in these areas. Many communities and states still emphasize isolating special populations in special facilities. Groups still superimpose their wishes on special populations whether these approaches and procedures are appropriate or desired by the group. Many facility and equipment modifications are not wanted or needed. On the other hand, basic accessibility still remains a major problem. Special projects, task force groups, advisory panels, planning committees, and countless other groups explore problems of facilities and equipment for special groups. Unfortunately very few of these groups involve or even ask input from or opinions of those who are to be most directly involved (consumers and their families).

As a result:

1. Some playgrounds designs for severely and profoundly retarded adults can best be used by Marine Commandos[1].
2. Braille trails go unused by the blind[1].
3. Totally accessible facilities are found to be far from totally accessible[1].
4. Countless millions of dollars are used to build special

facilities not needed or wanted by the group for which they were designed[1].

5. People are ripped off unmercifully by guarantees that don't exist and expensive devices that can be obtained free or made inexpensively.

6. Individuals are prostituted by special programs, unique aids, and scientific sounding programs, activities, and devices that are not special, unique, or scientific.

Much extensive and expensive special facilities are unnecessary. Participants want to take part in programs conducted in facilities that are as little different from those used by their peers and contemporaries as possible. Basic accessibility is the key to use by even the most severely involved person. Legal, moral, and ethical reasons exist to take this tact and follow this approach. So many of the most practical, functional, and realistic adaptations have been initiated by consumers themselves. Consumers must be involved; we must listen and heed what they say.

Research

Research of all types (basic, applied, historical, descriptive, experimental) is being sponsored and conducted by many individuals and groups throughout the United States and throughout the world. Master's theses, specialists' projects, doctoral dissertations, seminar papers, wildfire efforts, funded projects, programmatic approaches are among the many specific ways in which research is carried out. Reports are carried in journals, special publications, monographs, and annuals, and presented at conferences, conventions, seminars, clinics, institutes, and symposia. Increasingly research is being placed on microfilm although many printed sources and resources are still available. Only recently the American Alliance for Health, Physical Education, and Recreation published through its Unit on Programs for the Handicapped and Information and Research Utilization Center an Annotated Research Bibliography in Physical Education, Recreation, and Psychomotor Function of Mentally Retarded Persons (Information and Research Utilization

Center, 1975a) that contains annotations and listings of almost 900 studies conducted between 1888 and 1975. A concerted worldwide effort could result in several thousand more studies in these areas being located.

Recent efforts of the Division of Innovation and Development, Bureau of Education for the Handicapped, Department of Health, Education, and Welfare have stressed coordinated programmatic research in this area opposed to previously fragmented individual projects. A major thrust in this direction was carried out by the AAHPER Information and Research Utilization Center in Physical Education and Recreation for the Handicapped (IRUC) which completed state of the art statements in over 20 specific areas related to physical education and recreation for special populations (Information and Research Utilization Center, 1976). Recent projects of other groups have gathered information and developed state of the art statements for specific areas such as early childhood education, activity analysis, leisure counseling, and leisure time activities of special populations.

A number of general paradoxes and dichotomies emerge as one reviews research findings in these areas. Probably in no area is this more noted and obvious than in the major consideration of this specific seminar (mental retardation).

For example:

1. Despite emphasis on individualization and meeting needs of each persons, major considerations for success or failure still are influenced greatly by standards and performance on tests that can be quantified.

2. Despite emphasis on performance based on specific terminal and enabling objectives, assessment is still governed or at least greatly influenced by normative test scales.

3. Despite a great deal of lip service given to recognizing the interests, abilities, and background of each person, categorical thinking and programing still dominate efforts, activities, and programs.

4. Despite emphasis on assessment through criterion measures, normative devices and techniques still predominate and dominate at every level.

5. Despite knowledge and information that suggest mentally retarded

persons often need repeated opportunities to attain satisfactory performance on a variety of tasks, success is still determined in many situation on the basis of three to five attempts.

6. Despite research and practical evidence to the contrary, mental age still is used as a major emphasis in determining activites for mentally retarded program participants.

7. Correlational techniques and studies are still widely used as statistical devices for determining cause and effect relationships.

8. Debates continue to rage over efficacy of homogeneous versus heterogeneous grouping especially when this means involving individuals with different handicapping conditions with each other or with the non-involved population.

9. Despite evidence that strongly indicates learning to be very specific in nature, research and assessment approaches are still predicated upon the concept of generalized transfer occuring in learning.

10. Efficacy of using research and assessment techniques appropriate for and successful in the physical sciences for similar activities in the behavioral sciences must be determined.

Careful analyses of almost 900 studies and review of countless other research reports, projects, and activities reveal the following relative to physical education, recreation, and psychomotor function of mentally retarded persons:

1. Physical fitness, motor ability, and physical proficiency levels of mentally retarded persons can be improved; increasingly mildly (educable) retarded persons are achieving physical and motor tasks in same distribution found in the general population.

2. Retarded persons can learn all motor skills their nonretarded contemporaries learn; there is a great deal of overlap in performances of mentally retarded and nonretarded individuals.

3. Physical education and recreation activities must be broken down into small components and the basic simple to complex principle of teaching fully used.

4. Motivation and individual success are cornerstones for a successful overall program; success breeds success and often leads to reversal

of the failure frustration cycle in which so many retarded persons have been locked.

5. Retarded persons of all ages can accomplish worthwhile objectives when provided with appropriate, sequential, and progressive programs and opportunities within the scope of their individual abilities and interests.

6. Little transfer of skill has been shown from one activity to another. Conversely, there is great specificity in motor activity and learning as transfer appears to occur only under specific conditions.

7. Substantial correlation between motor performance, physical proficiency, and intelligence has been noted in mentally retarded subjects, especially those at lower functional levels (i.e., severely, profoundly, and some moderately retarded persons).

8. Novelty activities, motivational devices, unusual programs, and a variety of methods contribute to successful performance and in stimulating retarded persons to achieve.

9. Fine motor skills appear to be an important attribute in developing vocational skills that can be used in sheltered workshops or in jobs per se.

10. Social relationships, peer acceptance, and other indicators of true group interaction and integration do not automatically result for retarded children through active participation in physical education, recreation, and related activities. Although some studies have shown positive relationships among a variety of physical/motor and social characteristics, several others have shown retarded youngsters in both regular and special physical education programs less accepted and more rejected at the end of such experiences than at the beginning.

11. Today information and generalizations about physical fitness, motor ability, and physical proficiency levels of moderately (trainable) mentally retarded persons are made in the same ways they were made about mildly (educable) retarded persons 5 to 15 years ago. Research, empirical, and practical experiences gained from extensive work with mildly retarded persons are being shown applicable and appropriate to moderately retarded populations.

12. Bases for research studies, project support, program efforts

and statements about physical fitness, motor ability, and physical proficiency of mentally retarded populations continue to be dominated by statistics and results of studies at least 6 or 7 years old. Little use or application of findings from more recent studies has been noted.

13. Differences have been found in studies involving institutionalized populations and those enrolled in public school programs. In general, those from residential facilities have consistently scored lower than those in public school programs.

14. Specific contributions of active participation in physical activity programs to other facets of a mentally retarded child's education and development have been reported. These activities have served as bases for art projects, english assignments, oral expression, safety lessons, and arithmetic manipulations. Self-concept has increased; greater vocational productivity has resulted; and a variety of speech impairments have improved in the stress-free, noncompetitive, and accepting environment of these programs which were helpful to the individual in building confidence and becoming better able to deal with stresses of everyday life.

While many of these preliminary findings are little different from reviews and analyzes reported as much as 12 years ago, more studies, reports, and evidence make statements more positive and definitive; questions and suppositions of the past now can be answered with research, empirical and experimental evidence. Preliminary analyses suggest unanswered questions that need to be proved in future studies, projects, and programs. For example:

1. How does the Hawthorn effect influence results and performances of retarded persons in physical education and/or recreational activities?

2. Do retarded participants accomplish more in the mainstream or when they participate exclusively in special/separated programs and activities? How can determinations be made when an individual is ready to participate in regular programs and when he should remain in special programs and activities? Do certain activities lend themselves more to mainstreaming and others to participation in special programs?

3. What are needs for more studies on influences of recreation

participation and activities on mentally retarded participants? (There are now substantially fewer studies in recreation than in physical education).

4. What are influences of intellectual loading on results of studies and findings in these areas?

5. What is really being measured by various test/evaluation instruments, batteries, and items? (This is especially crucial in that the same devices have been used in study after study and program after program). How do these instruments in themselves affect results, conclusions, findings, and generalizations made from their use?

6. What do test norms really indicate? What do they tell? To what extent have norms been revised and made appropriate for different groups of subjects in various situations and under different circumstances? Are instruments appropriate for populations for which they have been designed (i.e., analyses thus far show that the Youth Fitness Test has been used almost six times as much as the Special Fitness Test in studies involving retarded subjects)?

7. What are inter and intra-etiological relationships with motor performance, physical proficiency, and movement activities?

8. What effect does utilization of the same subjects in a series or several independent studies have on results and findings? What effects have test instruments and personal relationships with instructors, researchers, leaders, and testers had on findings, results, conclusions, and performances?

9. How can success, feelings of accomplishment, fun, and other affective contributions be measured objectively?

10. How can conflicting results in studies be rationalized and explained?

11. What are effects of different types of program placement, specific activities, time allotment, and various methods and techniques on performances, test results, and research findings?

Various information systems, materials centers, resource networks, and related groups provide information about research in these areas of concern (Information and Research Utilization Center, 1975b). Greater coordination and cooperation among many of these groups are being pursued.

Specific status of research, trends, and needs are presented in considerable detail in these other sources and will be repeated here (Information and Research Utilization Center, 1976).

Coordination

Great strides and progress in these areas have been made in the last 10 to 15 years. Much remains to be done. Too much lip service is still given to multiagency coordination and interdisciplinary cooperation; more action is needed. In the United States we are still facing today many of the same problems that confronted the Scandinavian Countries in the mid-1960's. Jealousy, competition, duplication of effort and mistrust exist in too large amounts. Only when the cause is shouted and the organization whispered will disciplinary barriers disappear, petty ego defenses dissolve and professional empires vanish. Then and only then will we attain the pinnacle of success for which all say they are striving. Handi-in-hand with and led by consumers - those we are all dedicated to help gain greater independence - we will walk a little taller and have a greater spring in our step for it will no longer be us and them; together we will have overcome.

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Footnotes

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The PREP Program: A preschool play program for moderately mentally retarded children

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In 1972 the Department of Physical Education at the University of Alberta, under the leadership of Dr Patricia Austin, recognized the need for the development of instructional program materials designed to improve the gross-motor play skills of preschool children who were moderately mentally retarded. Financial assistance from the Government of Alberta, Department of Social Services and Community Health, Division of Services for the Handicapped, was received for the establishment of the PREP (Preschool Play Program) Centre on the university campus. Five major objectives were defined for the PREP Program; these included the development of:

1. Suitable gross-motor play instructional materials for preschool moderately mentally retarded children.
2. Appropriate teaching strategies to use with the above program materials.
3. Information on the design of equipment and apparatus within the playroom environment.
4. Teacher training programs for university students and inservice-training programs for professionals in the field.
5. A demonstration centre providing a direct service to a selected group of children in the community.

In January, 1973, the PREP Program began working with preschool children from the Dr Winnifred Stewart School for Retarded Children; the children, with their class teachers, were transported three mornings each week for two hours of participation in the program. This arrangement has continued, for the entire school year, since the PREP Program began. The enthusiastic cooperation of the teachers and the administration of the school has played a major role in the development of the PREP Program. The enjoyment of the children within the program has reflected the benefits of this cooperative effort in program development. This paper presents a brief outline of the theoretical framework underlying the program development and research efforts in the PREP Program Centre and a description of some of the major aspects of the program itself.

Theoretical rationale of the PREP Program

Information on the child, the program content, the play environment and the behavior of the teacher provides the theoretical rationale for the PREP Program. Each of these important factors in program development are discussed below.

The child

The central purpose of the PREP Program is the development of gross-motor skills which enable the children to play in as culturally normative a manner as possible. The children exhibit wide individual differences in their motor performance and play skills; therefore, individual evaluation and instruction is required. The motor development needs of the children are evaluated and decided upon within the context of their physical, intellectual, social, and emotional needs. Information from a number of sources provides the framework for evaluating the motor development needs of the individual children.

The classical studies on the hierarchical sequence of motor development provide a general guideline for establishing the expected motor proficiencies of the children (Bayley, 1935; Gesell & Armatruda, 1947; Illingsworth, 1972). The above information is supplemented with the results of motor development studies of mentally retarded persons (Bruininks, 1975; Rarick, 1973).

In an attempt to understand some of the factors that might account for the differences in skill acquisition and performance between intellectually normal and mentally retarded children, information from research studies in human motor performance is utilized. Attentional, short term and long term memory, response, and feedback mechanisms are important component processes that underlie the acquisition and performance of skilled movements (Keele, 1973). Unfortunately, there is a paucity of research applying this theoretical model in the area of the motor performance of the mentally retarded; however, indications of its importance and possible uses stem from the considerable body of knowledge available from studies in the cognitive-verbal domain that have employed an information processing theoretical model. Some of the key findings that have implications for motor skill acquisition in mentally retarded children include: verbal short-term memory rehearsal deficits (Brown, 1975; Ellis, 1970), selective attention difficulties (Brown, Scott & Urbano, 1972, Fisher & Zeaman, 1973), reaction time differences (Baumeister & Kellas, 1968; Gosling & Jenness, 1974), and response initiation problems (Berkson, 1960; Groden, 1969).

The PREP Program staff views each child from a basic behavioral viewpoint; however, research results based on the information processing model are utilized in an attempt to gain as full an understanding of each child as possible. Research efforts using the human motor performance model with the mentally retarded are needed (Wall, 1976).

Program content

Play is an important process in the optimal development of all children (Barnett, 1976; Ellis, 1973). General observation and recent empirical evidence indicates that mentally retarded children of preschool age do not play as effectively, in terms of the level of motor performance exhibited, as their intellectually normal counterparts (Benoit, 1955; Watkinson, 1977; Wehman, 1975).

The selection of PREP Program objectives is based on the assumption that improving individual gross-motor skills, that are important in free play situations, will lead to more effective play behaviors. The play skills selected for individualized instruction are those that are culturally normative and are within the capabilities of the children in the program (Watkinson, 1976). The individualized instruction in these skills takes place within a free play environment that is designed to elicit purposeful play behavior. The factors considered in planning the play environment are discussed in a later section of this paper.

The individual gross-motor play skill sequences are hierarchically structured using standard task analysis methods. Each learning step in the task analysis is stated in behavioral terms based on criterionreferenced measurement criteria (Glaser & Cooley, 1973; Mager, 1962). The information processing capabilities of the children are considered when developing a task sequence, and the environmental factors that control the information load of each task are manipulated to ensure an optimal motor learning progression (Robb, 1972; Williams, 1974). The task sequences are used regularly with the children and the recorded results are analyzed for ordinality. Revisions to the task sequences are made on empirical and theoretical grounds throughout the year.

Teacher behavior

The instructional strategies used in the PREP Program reflect the integration of information from the human motor performance and applied behavioral analysis models. Gentile (1972) and Nixon and Locke (1973) have presented models of motor skill acquisition in which the role of specific teaching behaviors are related to the different aspects of the learning process. In order to optimize motor skill acquisition the importance of the following teacher behaviors are stressed: setting realizable goals, ensuring adequate motivation, structuring the learning environment, guiding selective attention, developing the motor plan, setting suitable practice conditions, and providing for intrinsic and extrinsic feedback. Many of these ideas are considered when developing the PREP task sequences, furthermore, effective teachers in the one-to-one teaching-learning situation use these ideas and adjust their response to them on the basis of the individual needs of the children they are teaching. The information on the differences between intellectually normal and mentally retarded children on certain component processes underlying motor performance provides a framework from which to evaluate more precisely the needs of each individual child.

The teachers in the free play and individualized instruction situations utilize the basic techniques of applied behavioral analysis (Craighead, Kazdin & Mahoney, 1976). In free play sessions, in an attempt to increase purposeful play behavior, the teachers positively reinforce these behaviors and actively encourage the children to increase the frequency with which they use certain pieces of equipment. The above applications of behavior modification principles in the program tends to minimize the tendency on the part of some of the children not to attempt new or challenging tasks (Gardner, 1971). The use of shaping and fading techniques are an integral part of the teaching of the skills in the task analysis sequences.

Play environment

The children in the PREP Program exhibit wide individual differences in motor performance and play behavior; therefore, an individualized instruction program in which the teacher-pupil ratio is approximately one to five is used. This method results in considerable free play time for the children; therefore, the design of the play environment is an integral part of total program planning for it must stimulate the children to play purposefully if optimal motor development is to be realized.

The following criteria are used to evaluate the equipment and apparatus for inclusion in the playroom:

1. Is the equipment safe for free play use by the children?

2. Does the equipment meet the play needs of the children based on their repertoire of play skills?

3. Does the equipment provide for skills that are found in culturally normative play areas?

4. Does the equipment stimulate the children to use it?

5. Does the equipment provide for a variety of uses?

6. Is there sufficient protective matting to encourage rolling, jumping, and climbing play skills?

7. Is there sufficient space in the playroom for fundamental play skills such as running, jumping, tricycling, and ball playing?

Recent research on play environments have been used to improve the design of the PREP playroom (Bowers, 1975; Smiley, 1974). Information on the following aspects of playroom design has been considered: the key features of play equipment (Gramza, 1973; Gramza, Witt, Linford, & Jeanrenaud, 1969; Thorum, 1976) and the complexity and layout of playrooms (Karlsson & Ellis, 1972; Wade & Ellis, 1971). Further research on factors in the play environment is needed.

The above four factors cannot be viewed in isolation; changes in one area demand changes in another. The interaction of these factors provides the theoretical framework upon which the ongoing process of program development in the PREP Program is based. A description of some of the major aspects of that program is presented in the next section of this paper.

The preschool play program model

The PREP Program Model is based on the integration of information on the above four crucial factors that must be considered for optimal play program development. The result has been a unique combination of individualized instruction on prescribed play skills, group activity on prescribed skills, and free play activity in a well-planned environment.

The model is feasible because it allows a teacher to deal with a number of retarded children on an individual basis and, at the same time, provides for the group as a whole. It does not require excessive equipment and can be used either in small parcels or as a complete curriculum, whichever is suitable to the program leaders.

The program model uniquely combines freedom and choice in play with skill instruction. The children are free to play at whatever level of sophistication they are capable of, to be interrupted only at well-chosen moments by the teacher who interjects instruction in prescribed activities at this time. Typically, then, a child spends a large percentage of his time in free play and at intervals throughout this time he receives brief periods of instruction on prescribed skills. Those children who show less sophistication in their play skills receive more assistance and instruction while those who use their free time constructively spend more time in free play alone, or with other children. All children can become involved in 5 minute periods of larger group instruction (8-10 children) at appropriate intervals in the program.

The instructional model

The variability in play patterns and play skills of retarded children has been demonstrated in several studies (Keeran, Grove & Zachofsky, 1969; Noble, 1975; Wall, 1974; Watkinson, 1977). While some children approach normal peers in the level of their skill and their application to play situations, others show virtually no skill in play, and relatively little spontaneous play behavior during free time. Besides this wide range in terms of motor skill, there also exists great differences in attentional, language, and other skills needed to benefit from instruction. In planning instruction there is a definite need to recognize the wide range of individual differences in children with respect to these factors. Individualized instruction is probably the best way to take these differences into account; therefore an individualized approach to instructional planning was chosen as the most suitable for this population.

The process of individualized instruction in motor skills for retarded youngsters requires:

1. The identification of a wide range of skill objectives for assessment and instruction.

2. The prescription of instructional objectives based on the assessment of individual needs.

3. The application of strategies of instruction that suit individual learning styles.

4. The use of constant assessment of status and progress for evaluating instruction.

Wessel (1975) adopted a model for teaching motor skills to elementary school-aged retarded children using an individualized approach. This teaching model suggests that the teacher follows six basic steps in order to individualize instruction.

1. The teacher must plan objectives for assessment and instruction based on what he sees as appropriate educational content for the child(ren) in the program.

2. The teacher must assess each child on these objectives so that he knows exactly which of the objectives have and have not been reached.

3. The teacher must prescribe instruction on objectives that the child has not attained.

4. The teacher must teach using instructional strategies that are suitable for each child.

5. The teacher must evaluate the effectiveness of his teaching on student achievement.

6. Based on information from this evaluation the teacher must modify his plan to more closely meet the child's needs.

Planning

The goal of the PREP Program is to learn to play. Five categories of motor skills were seen as basic components of play: body awareness, body control, locomotion, object control and specific equipment skills. Specific skills were identified within each of these components and written behaviorally as Terminal Performance Objectives (TPO). Figure 1 shows the hierarchy of skills identified.

A TPO was seen as a play skill that should be part of the skill repertoire of all young children. Each TPO was subjected to a task analysis that resulted in the identification of a "task sequence" composed of a sequence of skills whose acquisition would lead to the attainment of the TPO. Each task in the "task sequence" was written as a behavioral objective with the behavior, conditions and standards specified. The sequences have undergone formative evaluation to determine the validity of the sequence, the appropriateness of the tasks and their feasibility for instruction. An example of a "task sequence", in this case for the TPO of tricycling, can be found in Figure 2.

Levels of student response to each task were identified, using amount of teacher intervention as the criterion. Five response levels, ranging from complete manipulation of the child by the teacher to complete independence of the child (initiation of the task without prompting) were identified. These five levels of response are outlined in Figure 3 and are specified behaviorally for each task in the task sequence. These response levels are used for assessment as well as for instruction.

Teachers are advised in the planning stage of the program to: (a) understand the organization of the "goal", TPO and "task sequences";

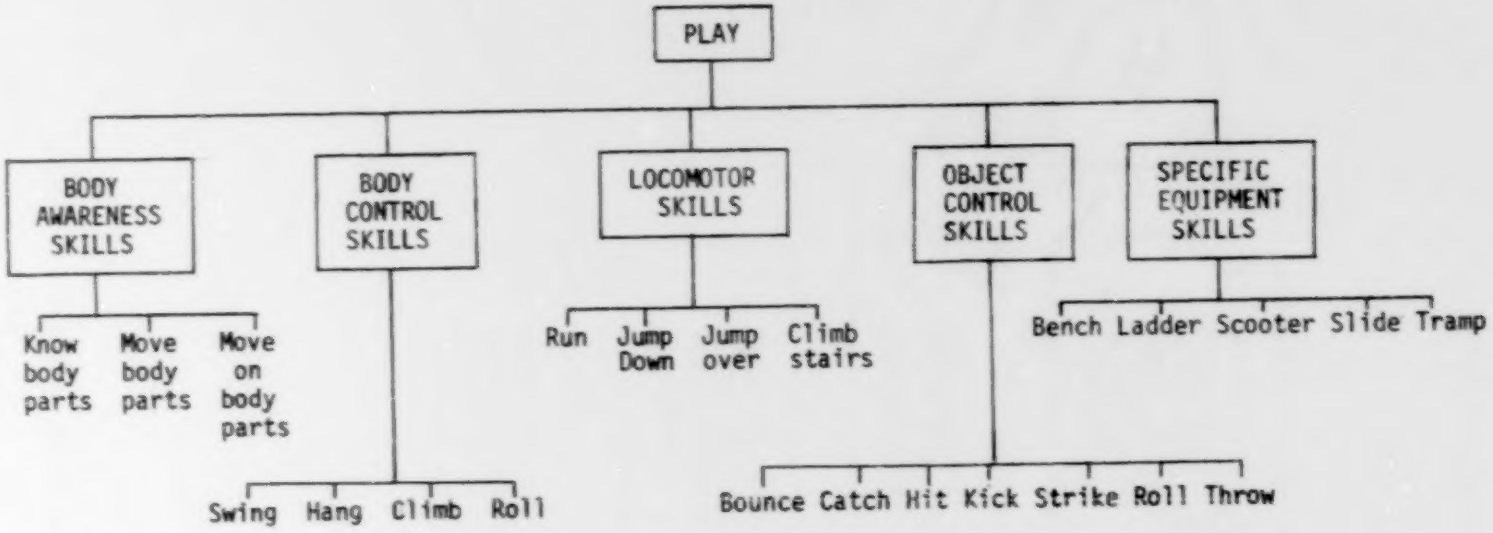
PLAY
BODY AWARENESS SKILLS
BODY CONTROL SKILLS
LOCOMOTOR SKILLS
OBJECT CONTROL SKILLS
SPECIFIC EQUIPMENT SKILLS
Know body parts
Move body parts
Move on body parts
Swing
Hang
Climb
Roll
Run
Jump Down
Jump over
Climb stairs
Bounce
Catch
Hit
Kick
Strike
Roll
Throw
Bench
Ladder
Scooter
Slide
Tramp

Figure 1. Hierarchy of play skills.

TPO: To pedal a tricycle

TASK SEQUENCE

1. Sit on tricycle with hands grasping handlebars, feet maintaining contact with the pedals while being pushed 20 feet on three separate occasions.

2. Push tricycle pedals six times after being given an initial push on three separate occasions.

3. Pedal for 20 feet starting from a stopped position (child initiates motion himself) on three occasions.

4. Pedal the tricycle for 20 feet steering around 3 obstacles placed in pathway on three separate occasions

Figure 2. Terminal performance objective (TPO) and task sequence for tricycle riding.

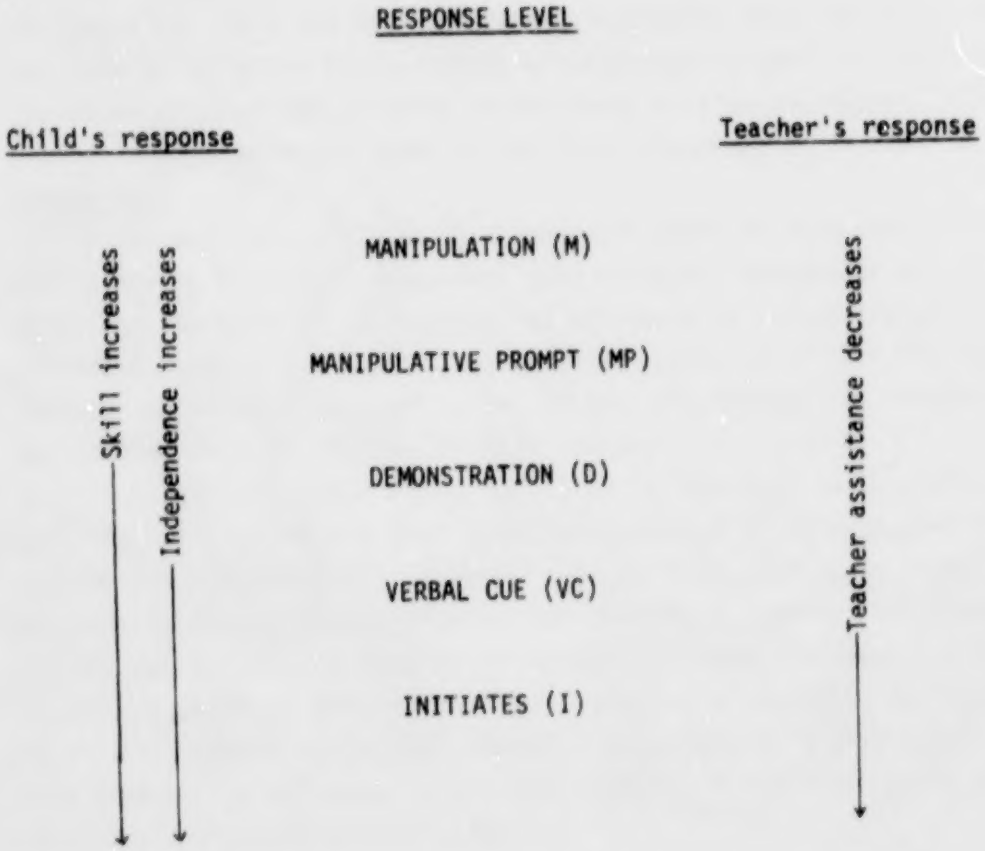
RESPONSE LEVEL
Child's response
Teacher's response
Skill increases
Independence increases
MANIPULATION (M)
MANIPULATIVE PROMPT (MP)
DEMONSTRATION (D)
VERBAL CUE (VC)
INITIATES (I)
Teacher assistance decreases

Figure 3. Levels of learner response to instruction.

(b) learn the TOP's and make considered judgements about the priorities for each child in the group. Space and equipment as well as specific characteristics of the children in the group must be considered; (c) become familiar with the order of the "task sequences".

Assessing

Assessment is one of the most important parts of individual instruction since it is through assessment that a teacher determines which skills of the hierarchy each child has and where he is performing in the "task sequences". Knowing what a child can do, will tell the teacher what the child needs to learn to do, so that the teacher can concentrate on teaching those skills the child is lacking.

In assessing a child's play skills it is important to know both what the child can do and what he actually chooses to do with some frequency. Presumably the skills he chooses to do when he is alone and playing freely are well-learned and require no instruction. Those that he can do but only when asked perhaps, or shown, may need practice or encouragement so that the child will eventually choose to do them on his own. Those skills that the child cannot do, even when asked, need instruction and practice and encouragement before they can be used when they are needed in play activity.

It is important then that teachers spend some time observing the child in free play to determine which TPO's and which tasks in the "task sequences" are initiated before assessing with teacher intervention (i.e., verbal cue, demonstration, prompts, complete manipulation). The Individual Student Profile can be used to accomplish this assessment. The TPO, "task sequence", and "levels of response" are presented in short form in a matrix (Figure 4) so that the teacher can simply put a check in the appropriate box for each skill.

Teachers should assess on the TPO's first. This is the equivalent of the last task in the "task sequence". Assessment should then proceed through the tasks of the high priority TPO's until a comprehensive individual profile of skills is completed.

Prescribing

Once a comprehensive assessment of the child's skills has been completed the teacher prescribes one or two skills for individual

TPO tricycling	No response	Manipulation	Manipulative prompt	Demonstration	Verbal cue	Initiates
1. Sits with feet on pedals while pushed						
2. Pedals after initial push						
3. Pedals 20' forward						
4. Steers tricycle around obstacles						

Figure 4. Task sequence and levels of response for tricycle riding. riding.

instruction. TPO's are chosen for instruction based on priorities outlined in the teacher's manual. Instruction within a TPO is prescribed for the task that follows the one the child is capable of doing with a verbal cue or demonstration.

Teaching

Teaching of the skills follows the continuum outlined in the learner response categories. Teachers begin by using complete manipulation of the child's body to complete the response, then this is reduced to physical prompts, finally to demonstrations and verbal cues. Descriptions of each of these levels of instruction are written for each task in a "task sequence".

Teachers use the principles of behavior shaping to move the child from one response level to the next. Manipulative and verbal cues are faded, as soon as possible, in order to encourage the child to become independent in play.

Evaluating

Teachers keep daily records of student behavior on the daily record form presented in Figure 5. The TPO and the task in which instruction took place is recorded along with the child's response level (M, MP, D, VC, I) and an estimation of the time spent in instruction or the number of completed response.

Teachers use the information from the daily record form to: (a) know where instruction should begin each day, and (b) be sure each child is getting sufficient instructional time on each prescribed skill.

At the end of every second week this information is transferred on to graphs, presented in Figure 6, so that an ongoing record of a child's behavior in each prescribed skill is kept.

Teachers use the information from the graphs to: (a) determine overall progress of the child on each prescribed skill; (b) determine when to terminate instruction because of insufficient progress or achievement of the TPO, and (c) make decisions regarding instructional strategies that have been implemented over each two week period.

Decisions are made based on guidelines from the teacher's manual.

Daily record form

NAME: ______________________

MONTH: ______________________

	TPO ________			TPO ________			COMMENTS
	Task	Response level	Time/ number	Task	Response Level	Time/ number	
Week 1 MONDAY							
WEDNESDAY							
FRIDAY							
Week 2 MONDAY							
WEDNESDAY							
FRIDAY							

Figure 5. Daily record form for recording child performance during instruction.

STUDENT ______________________

T.P.O. ______________________

Preschool Play Program
Department of Physical
Education
University of Alberta

TASK 6	I																																								
	VC																																								
	D																																								
	MP																																								
	M																																								
TASK 5	I																																								
	VC																																								
	D																																								
	MP																																								
	M																																								
TASK 4	I																																								
	VC																																								
	D																																								
	MP																																								
	M																																								
TASK 3	I																																								
	VC																																								
	D																																								
	MP																																								
	M																																								
TASK 2	I																																								
	VC																																								
	D																																								
	MP																																								
	M																																								
TASK 1	I																																								
	VC																																								
	D																																								
	MP																																								
	M																																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

DAYS IN INSTRUCTION

Figure 6. Daily progress chart for recording progress on prescribed TOP's

Interjecting instruction into free play

Individual instruction is interjected during free play. Teachers attempt to make use of spontaneous play to teach prescribed skills; but at the same time an attempt is made not to interrupt constructive play behavior for the purpose of instruction. Guidelines to help the teacher decide when to begin instruction are included in the teacher's manual.

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Fondement de l'éducation psychomotrice du déficient mental: une adaptation de la théorie de Hebb

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Nous commençons à voir la fin d'une longue période antithéorique dans le domaine de la déficience mentale. Pendant plusieurs décennies on a cultivé une perception atomisée du problème. On a accumulé des faits et des opinions avec acharnement. On a produit des ouvrages encyclopédiques. Ce sont généralement des amas d'information sur différents aspects de la déficience mentale, sur les aides qu'on y a apportées; à cela s'ajoutent quelques suggestions sur le traitement qui s'impose, inspirées principalement par le bon sens.

Ainsi, ce fut par une sorte d'inspiration fortuite que l'on préconisa l'activité physique comme remède et instrument pédagogique pour le déficient mental. Celui-ci, évidemment, est plus capable de mouvement que de pensée. C'est naturel de vouloir le mettre à l'oeuvre sur le terrain de ses capacités visibles et concrètes.

Il importe ici de bien comprendre: les éducateurs sont sur la bonne piste lorsqu'ils considèrent la psychomotricité comme moyen privilégié dans l'éducation du déficient mental. Mais il faut mettre l'accent sur le psychisme encore plus que sur la motricité elle-même. Le déficient mental ne s'aide pas lui-même beaucoup (bien qu'à tout le moins il s'empêche de moisir) par ses mouvements purement répétitifs, primitifs, par ses activités trop séparées d'une information mentale et intentionnelle, qui garantit un rattachement à des perspectives intellectuelles, affectives, sociales et de plus en plus humaines. Voilà ce dont il sera question dans cette communication. C'est une adaptation au déficient mental de la stratégie générale de l'éducation par le mouvement.

Nombre d'auteurs contemporains ont démontré l'influence profonde de la motricité dans tout apprentissage. Celui-ci commence dans le mouvement et, à toutes les étapes du développement, continue d'en être fortement imprégné. Le déficient mental doit faire le même cheminement que l'être normal. C'est d'ailleurs ce que suggère l'histoire de l'être humain normal chez qui l'évolution initiale est visiblement et prioritairement motrice.

Par le passé, on s'est bien souvent impatienté à force de vouloir inculquer une pensée dans le crâne du déficient mental, comme s'il s'agissait d'un transvasement. Ainsi on a travaillé avec acharnement au développement de concepts, par des aménagements de perceptions et d'expériences plus ou moins adaptés. Souvenons-nous de l'angoisse de Strauss et de Kephart.

Il faut franchement reconnaître que l'humanité semble perpétuellement en deuil face au déficient mental. On en a pitié, on s'en plaint. On attend un peu d'évolution avant d'entrer en jeu avec tous les talents disponibles. Cette attitude s'applique davantage aux familles. Au cours de nombreuses visites dans les foyers on constata une grande différence dans l'approche familiale au déficient mental face aux autres enfants. On le couve; on le sert; on lui épargne le souci de l'exploration. On lui accorde un traitement royal, en mettant tout à sa portée. Pourquoi ferait-il des efforts quand tout est si bonnement mis à sa disposition? Pourquoi tenterait-il de se trouver des solutions, quand tout est réglé pour lui? Pourquoi aurait-il besoin de mieux connaître et maîtriser son environnement, quand il est entouré d'autant de service? Sans trop le savoir, donc, on s'est beaucoup efforcé de borner son épanouissement, tout en faisant pour lui assez pour sembler s'intéresser à son éducation, et ainsi éviter l'accusation d'être anti-pédagogique.

C'est ici que la théorie doit nous éclairer et nous diriger. Hebb, que l'on n'a pas efficacement contredit depuis qu'il a publié son ouvrage monumental en 1949, affirme que le comportement humain est organisé; qu'il y a de la dépendance et de l'influence mutuelles entre les unités qui le composent. Il y a aussi organisation dans le développement; il y a des antécédents pour toute nouvelle émergence.

Hebb a basé sa théorie sur les regroupements cellulaires qui sont actualisés dans toute expérience formelle. Ces regroupements sont pour ainsi dire indéfinis, et varient selon la nature des stimuli externes et internes. Il importe donc pour l'enfant d'éprouver, dans son environnement, le plus grand nombre possible de situations. Sa tâche est d'explorer, de toucher, de ressentir, de s'émerveiller, de s'interroger, de réagir en fonction de ses découvertes; et le processus doit se maintenir sans cesse. Ainsi, le petit parc que l'on voit surtout chez les familles à l'aise est un ennemi de l'éducation du tout-petit. Mieux vaut de soulever de trois pieds toute la culture, y inclus ses apanages, et laisser à l'enfant sa pleine liberté d'exploration.

La même nécessité de protéger le devenir du déficient mental est de rigueur. Il faut en finir avec l'attitude passive, la surprotection, et s'engager dans la stimulation, l'accroissement de la curiosité. Il n'y a pas à attendre. Rien ne se fait quand on attend, sauf que le temps passe, et que plus on attend, plus l'action différée sera difficile à entreprendre. L'être humain, même déficient mental, est dynamique dans sa réalité. Il apprend constamment, au moins à ne rien faire et ainsi à se réduire au néant.

Mais retournons quelque peu en arrière. Depuis le début de la psychologie, on s'est attardé à comprendre l'évolution humaine, et surtout le fonctionnement du psychisme chez l'enfant. Au début on utilisa la méthode psychophysique pour étudier la sensation. Plus tard, on s'attaqua à la relation langage-pensée. Plus récemment, on examina l'apprentissage; nous connaissons en ce domaine des noms célèbres: Guthrie, Hull, Lewin, Piaget. Entre-temps on s'intéressa à la perception des Gestalts. On s'attacha soit à la perception, soit à l'élaboration des perceptions en concepts, mais toujours en signalant des opérations critiques qui devraient définir tout apprentissage. Sans doute, les grands chercheurs ont contribué au progrès de la connaissance de l'évolution humaine, surtout chez l'enfant. Ils ont fait ressortir des faits ignorés jusqu'alors.

Il serait faux cependant de prétendre que tout a été expliqué. Il y a eu des éclaircissements, même nombreux; mais il y reste encore des domaines importants où persiste le mystère. Par exemple, Piaget nous décrit les étapes d'émergence de l'intelligence, mais il ne parle pas de ce qu'il y a à faire pour accélérer, faciliter son développement. L'enfant accumule de l'information, e.g., sur la conservation des quantités, sur la causalité, sur le temps, etc... Piaget ne s'arrête pas sur le fait même de la croissance rapide dans la perception du réel. Il ne s'occupe pas explicitement et profondément de l'émotion, du rôle du mouvement dans la perception et la pensée. Aussi personne ne semble avoir analysé adéquatement le problème de la cognition en l'absence de stimuli, ou le fait de la pensée nouvelle avec les yeux fermés. A ce point-là nous sommes loin de la psychologie stimulation-réaction, qui était à la mode avant la deuxième guerre mondiale.

Hebb s'adressa précisément à ces faits qui semblent être d'une importance plus centrale que ceux qui ont été signalés jusqu'ici. Au lieu de s'emballer, e.g., de la perception de la forme, il se demanda comment se fait-il qu'il entre tellement d'informations dans la tête du petit. Comment se fait-il que l'enfant se passe si tôt de la sensation dans ses pensées? Que si peu de sensations peuvent suffire à déclencher un long processus de pensée?

Hebb part de la structure du système nerveux central, qui est composé de 9 à 15 milliards de cellules. Il voit en cet amas le siège de la sensation et de la pensée. Toute information sensorielle finit par y parvenir et par y subir une gestion par la structure de l'organisation cérébrale. Hebb assume qu'il y a dans le cerveau des regroupements cellulaires qui correspondent aux sensations primitives. Fort probablement le nombre de celles-ci est restreint; mais il y a augmentation en fonction de l'expérience, qui mobilise progressivement de nouvelles cellules en groupes fonctionnels à mesure que la sensation et l'activité se différencient et s'élaborent. Les premiers stimuli ont un impact sur les organes de sensation qui vont ensuite activer les groupements de cellules dans le cortex. Selon que les expériences se répètent, les chaînes s'allongent et se fortifient dans leur identité; et il y a prolongement dans les diverses régions cérébrales, surtout dans les régions motrices et associatives. Il y a toujours un regroupement pour chaque sensation spécifique qui se répète. Le regroupement est perçu comme diffus, de façon tridimensionnelle, dans toute la substance neurale. Il est possible que la croissance se fasse grâce aux évolutions rattachées aux synapses neuromyoniques. Il semble bien qu'on trouve un appui pour cette formulation dans la recherche qui suggère un changement structural pour expliquer les faits mnémoniques.

Hebb énonce plusieurs descriptions hypothétiques de regroupements cellulaires qui sont à la base de sa théorie. Ainsi, il suppose une certaine équipotentialité dans les cellules qui fonctionnent en parallèle. Les chaînes, courtes au début, s'étendent en se ralliant d'autres cellules, plus ou moins contiguës, de sorte qu'essentiellement il y a une participation de nombreuses cellules situées dans les endroits qui régissent les diverses sensations et l'action motrice. La propagation de leur croissance requiert des stimulations d'extension optimale, soit sensorielle, soit psychomotrice. Il est possible qu'une cellule particulière participe à plusieurs regroupements dépendant de l'activation de cellules plus ou moins proches. Un fait plus important encore c'est qu'une chaîne agisse comme un système fermé, grâce à la tendance de réverbération créée par la continuité des interconnexions. Cependant les chaînes sont mutuellement intercalées pour ainsi faciliter les interrelations, comme par exemple, dans la perception de la couleur et de la forme d'un objet. Enfin, à mesure qu'une chaîne fonctionne, il y a changement dans la configuration, suite aux éléments d'expérience qui peuvent varier dans le temps. Surtout y a-t-il possibilité de court-circuiter dans les séquences initiales en fonction des renforcements et du développement de la cognition.

C'est ainsi que se construit le réseau de structures neurologiques qui sont à la base des sensations, comme aussi des mouvements. Il semble donc qu'il y ait, au début, des sensations-mouvements qui se libèrent très lentement de la motricité, mais qui n'auraient pas pu exister sans l'apport musculaire initial.

L'activation en contiguité temporelle, au moins partielle, des regroupements cellulaires engendre des structures organisatrices ou intégratrices à buts divers. Il peut s'agir de simple coïncidence fonctionnelle, comme lorsque des objets disparates comme un lit et une couverture sont perçus plus ou moins simultanément. L'organisme en fait une image globale, où les éléments sont représentés d'une façon simplifiée, mais qui suffit à engager tout l'ensemble en présence d'un seul élément. Ainsi la vue d'une couverture fait penser au lit, au repos confortable. Un très grand nombre d'unités fonctionnelles semblables peuplent le psychisme, même celui de l'enfant. Une cuillère lui rappelle son assiette; la voix de sa mère éveille le souvenir de sa bonté; et ainsi de suite.

Des regroupements plus complexes président au comportement moteur, dans lequel l'enfant perçoit d'abord pour ensuite apprendre par la pratique des séries de mouvements; il s'établit une structure neurologique qui rattache toute la "sériation" de sorte que l'occurence du début induit la séquence entière; même l'expérience d'un élément, soit intermédiaire, soit même final, peut déclencher la série. Le dernier mot d'une chanson peut inciter à tout recommencer. Le battement d'un rythme spécifique à une danse peut porter à la reprendre au complet.

Il y a de plus des ensembles de cognitions qui comportent à la fois des sensations et des mouvements. C'est surtout vrai dans le raisonnement quantitatif chez les petits. Une quantité se perçoit difficilement sans mouvement. Une superficie quelconque s'apprécie surtout par le fait de l'occuper corporellement. La perception, ici, est rendue possible par la locomotion et le sens kinesthésique. Il en est ainsi des diverses formes d'action ou de mouvement. Il y a des catégories de mouvements, des séries ou des ensembles de mouvements, qui peuvent être disparates mais qui forment un tout fonctionnel.

Enfin, une forme de chaînes ou d'ensembles se rapporte aux perceptions communes à plusieurs objets, perceptions qui sont le point de départ de la pensée abstraite. Ainsi on voit un cheval, une vache, un cochon, et on en retient les éléments semblables. Ici les structures neurologiques s'organisent pour rendre possible le concept d'animal. Avec ce concept on est en mesure de reconnaître plus facilement l'animalité chez les objets pertinents. Il est sensiblement plus difficile d'atteindre ces connaissances parce qu'elles ne sont pas recueillies sous forme concrète. Personne ne perçoit un animal en tant qu'animal, mais toujours un animal spécifique. Mais l'élaboration se fait tout de même, quoique lentement.

De toutes ces évolutions, surtout chez les enfants, il faut remarquer le rôle que peut avoir le mouvement, pour signaler, faire ressortir une perception, pour faciliter la mémoire et même l'association vécue de deux perceptions. Au début, on bouge pour ressentir et plus tard la pensée pousse au mouvement choisi; et la boucle continue, se raffinant constamment. Le mouvement conduit à la perception, qui éventuellement nourrit la pensée, qui peut retourner au mouvement, et ainsi de suite. Il est remarquable d'observer que même les grands penseurs se font des graphiques pour ordonner, concrétiser, consolider leurs pensées. Il ne faut donc pas s'étonner si les enfants ont de la difficulté à penser sans l'implication d'une myriade de mouvements, qui fertilisent la perception et la cognition d'une multitude de manières.

Il y a aussi une relation fonctionnelle et théorique entre la perception et l'action, d'une part, et les sentiments ainsi que les émotions d'autre part. Très tôt dans la vie de l'individu, une opération spécifique est reliée à un sentiment; pas seulement à un sentiment général, comme le bien-être, à une opération réussie, mais plutôt à un sentiment spécifique, comme le bonheur en relation avec une action individuelle. Ce n'est pas seulement le ressentiment du bonheur général qui pousse l'enfant à persister à téter le sein maternel; c'est plutôt une gratification spécifique (même spécifique à un sein donné) qui est perçue comme composante de la succion. Mais l'enfant peut être porté à la recherche d'un plaisir plus ou moins semblable dans une autre action, et ainsi il y a là le commencement concret d'une tendance qui se reconnaît comme une motivation. Celui qui a appris à se récompenser en ce qu'il fait est quelqu'un de motivé.

On peut s'élever à un très haut niveau dans l'évolution humaine, et constater que le contenu expérientiel ainsi que les fondements physiologiques et neurologiques qui se rattachent à une conception artistique, comme par exemple en architecture, semblent bien différer du tout au tout avec les sentiments d'espoir et de désir qu'on éprouve en apercevant une simple association entre deux objets quelconques; ou la contemplation d'un pont achevé est différente de la perception d'une association de mots dans l'apprentissage verbal. Mais il y a une analogie. Dans les deux cas, l'anticipation et la jouissance éventuelle portent à une action ultérieure, et de plus fortifient l'attente qui accompagne tout comportement répétitif. Il y a ici un sentiment à base physiologique et neurologique qui représente non seulement un état général, mais une multitude d'états émotionnels, qui jouent un rôle même au niveau neurologique pour susciter la poursuite d'une action. L'individu doit éprouver les composantes ainsi que les épiphénomènes d'ordre émotif, pour renforcer ses habitudes actives. Cela signifie qu'il y a plus, à l'apprentissage, qu'une succession de perceptions et de concepts. Il y a aussi un aspect dynamique, qui repose sur le système nerveux central, qui, lui, contribue au développement et à la consolidation de l'apprentissage. On n'apprend pas tout simplement des séquences par la répétition; on apprend plutôt par association avec des mouvements, avec des états d'attente et de jouissance anticipée, états qui sont aussi reflétés dans les structures neurologiques. L'art suprême de l'enseignement est associé au bonheur d'apprendre. C'est le rôle du maître d'évoquer chez l'élève l'espoir et la joie d'apprendre et se réjouir avec lui de ses acquisitions, en vue de susciter l'espoir actif de nouvelles expansions. Le point à souligner est celui-ci: il y a plus que du contenu dans l'apprentissage; il y a aussi un état émotif qui repose sur des structures neurologiques.

Récemment, une collègue, Madeleine Roy, Ph.D., de l'Université du Québec à Trois-Rivières, décrivait l'aspect dynamique des connaissances acquises. Ce que l'on apprend aujourd'hui est la semence de ce que l'on apprendra plus tard, semence des différenciations comportementales à venir. Tout apprentissage progresse vers la spécificité, et cela par la force même des choses. On pourrait se contenter de caractériser cet état comme une sorte d'élan vital; mais il est possible de le décrire un peu par ses composantes tant intellectuelles et psychomotrices, que physiologiques et neurologiques. L'individu agit avec des aspirations, des prémisses ressenties d'évolution à venir, un entrain, un optimisme justifié, qui tend à mobiliser l'énergie et ainsi stimuler à l'action, en vue d'éprouver de la joie ultérieure à travers l'action poursuivie.

Dans l'enseignement on est souvent porté à s'intéresser, d'une façon sèche et désincarnée aux associations. On n'apprend pas quelque chose à cause de sa valeur objective, mais bien à cause des sentiments qu'on y rattache ou qu'on éprouve à son endroit. L'enseignant doit présenter à l'élève l'espoir d'une récompense reliée à l'acquisition progressive, et il faut se souvenir en fait que la machine à apprendre qu'est l'être humain est agencée neurologiquement à cette séquence qui se renouvelle et s'étend sans fin. Ainsi, le maître organise la situation d'apprentissage au début; mais l'élève doit éventuellement assumer sa responsabilité dans son évolution. La tendance doit être fermement établie. Une fois qu'elle est opérationnelle, elle fonctionne indéfiniment; et alors nous constatons l'auto-motivation dans son état le plus pur.

A ce point, il est opportun de revenir à la motricité, qui entre dans toute sensation efficace, surtout en bas âge et qui parvient ainsi à alimenter la pensée, même la plus abstraite. Il importe de reculer jusqu'aux conditions qui favorisent la perception chez le déficient mental, pour en venir à comprendre ce qui peut faciliter son évolution intégrale.

Hebb assume que les structures organisatrices supérieures dépendent de la masse des cellules cérébrales en santé, que ces structures tirent leur origine des interconnexions anatomiques entre les structures inférieures activées plus ou moins simultanément, que l'intégration se fait par l'activation synchronisée des structures subordonnées, que lorsqu'une structure supérieure est fixée, elle peut déverser sa facilitation sur toutes les structures élémentaires, même sans rappel conscient, par exemple, plus on se familiarise avec les animaux domestiques, plus on se prépare à reconnaître d'autres animaux par les ressemblances.

Ainsi on peut passer d'un souvenir à un autre, sans devoir les avoir éprouvés ensemble. La structure organisatrice fait le pont. C'est par un réseau de telles structures que la pensée devient possible. On avance par association, les plus fortes se faisant ressentir les premières, surtout les plus apparentées. D'un autre côté, une excitation massive peut arrêter toute pensée. Trop de gâchettes sont tirées, et ainsi il y a confusion, un état qui suggère le style de pensée de celui qui a peu de structures bien formées. Il passe d'une structure à l'autre à la moindre stimulation. Ainsi on reconnaît l'hyperactivité: l'enfant présente un méli-mélo de mouvements exploratoires quand il n'a pas de structures organisatrices pour le diriger. On lui donne des tranquillisants pour le calmer; on devrait plutôt simplifier son environnement, et encadrer son comportement.

Celui qui souffre le plus fréquemment de cette condition c'est bien le déficient mental, que la société voudrait voir apprendre à se comporter d'une façon acceptable. Il y aurait des choses constructives à faire, par exemple cesser la surprotection, et encourager l'enfant à se prendre en charge, à agir à son niveau. Les perceptions primitives s'acquièrent aussi rapidement par les moins capables que par les plus capables; la défonctionnalisation cérébrale partielle n'empêche pas la perception, pourvu qu'il y reste assez de cellules pour la fonction essentielle. Il s'est accumulé beaucoup d'évidences pour montrer que même un cerveau endommagé peut s'engager dans l'apprentissage pourvu que l'on s'adapte à l'appauvrissement neurologique.

L'ajustement cherche à compenser, soit pour la population décimée dans la masse corticale, soit pour le manque relatif de vigueur dans les cellules individuelles. Dans les deux cas il faut tenter de multiplier les possibilités de points de contact entre les regroupements cellulaires. Ici un respect méticuleux s'impose pour la fonction neurologique des récepteurs ainsi que du système efférent, pour soutenir les perceptions et les mouvements. Par exemple, il faut engager une superficie plus étendue des sens, comme par l'utilisation de gros crayons, de gros caractères. Il faut accentuer la perception, par l'annexion de plusieurs dimensions stimulatoires, entre autres, par l'intégration du mouvement dans la tâche d'apprentissage.

Il faut aménager l'apprentissage de telle manière que les Gestalts s'acquièrent avec tous leurs éléments. Ceci est difficile parce que le jeune enfant, surtout le déficient, éprouve une surabondance de stimulations qu'il ne peut organiser, et qui sert donc à le confondre. Il faut donc solidifier le processus d'attention par des objets significatifs. Strauss disait que certains déficients mentaux sont essentiellement inattentifs ou distraits. Ce qui est vrai c'est que chez beaucoup d'enfants l'attention ne se développe pas beaucoup, parce qu'ils ne deviennent pas conscients des objets ou des activités qui les intéressent. Il s'agit d'en implanter, et ainsi, par le crible de ses intérêts, l'enfant choisit les stimuli pertinents dans la masse qui l'entoure, et les messages que transporte le système nerveux efférent.

On peut dire que ces acquisitions servent d'entonnoir aux stimulations qui bombardent l'enfant constamment. Quand il a un bon noyau de perceptions organisées, il cesse ses manifestations d'hyperesthésie, qui résulte du contrôle cortical altéré par des stimulations, plutôt que d'une baisse des seuils perceptuels des sens.

Ainsi un maître fait bien de simplifier sa situation pédagogique, afin de diminuer la stimulation distrayante, pendant que les structures organisatrices se renforcent dans une série de répétitions. Plus tard, une telle précaution pourra ne pas être pertinente; l'entonnoir métaphorique mentionné plus haut le préservera de la confusion.

On se plaint souvent de la rigidité du déficient mental, comme on voit parfois chez de vieux célibataires. Elle est due en grande partie au déficit d'expériences, au manque de communication entre les structures élémentaires et organisatrices. L'enfant se cramponne à certains stimuli, et il en reste là. Il faut organiser son champ de stimulations, enrichir ses expériences, permettre la perception de nombreuses relations, et ainsi, bien lancer le processus organisationnel de la vie consciente. Cela ne peut se faire qu'avec l'appui psychomoteur et émotionnel.

On ne peut guère exagérer l'organisation de la perception du jeune enfant dans son apprentissage. La répétition semble nécessaire (quoique l'on n'en comprend pas trop la raison), mais il faut aussi de l'ordre. Les relations doivent être présentées d'une manière systématique. Il est fort probable que le déficient mental diffère de l'être normal par le besoin croissant de répétition et d'organisation plus sensibles. L'enfant doit percevoir les relations fonctionnelles, les catégories taxonomiques, qui sont à la base du raisonnement, des décisions, des agissements moteurs. Ainsi, on donne un modèle pour faciliter la maîtrise d'une séquence d'actions; il y a là en effet, plusieurs sources de stimulations. On fait tout pour permettre à l'enfant de comprendre les étapes d'une tâche; on fait l'analyse des tâches selon les exigences. On présente à l'enfant des objets concrets, tangibles, qu'il peut toucher, manipuler, au lieu de tout simplement en parler. On relie la motricité aux tâches partout où elle peut être utile pour souligner la perception et ainsi engager davantage de substances corticales. Ainsi, il y aura plus de points de contacts pour accentuer l'interfacilitation dans les structures organisationnelles. On s'appuie sur la verbalisation tout au long d'une tâche pour la même raison.

Il est possible qu'il soit utile, sinon nécessaire, d'exposer l'élève à des tâches dont il sera question plus tard dans un apprentissage formel. Entre-temps, l'enfant s'habitue à un objet, à un objectif d'enseignement. D'ailleurs il aura à apprendre beaucoup de choses, qu'il ne comprendra vraiment jamais, mais c'est le prix à payer pour vivre paisiblement dans le milieu social.

Le contenu d'enseignement peut susciter de nombreuses questions. Sans doute, c'est l'objectif qui décidera du degré jusqu'où on étoffera le contenu. Ainsi on ne devra pas infliger des apprentissages pénibles à quelqu'un qui ne montera pas haut dans l'échelle des professions. Cependant, il ne faut pas être excessivement parcimonieux. C'est en travaillant à l'épanouissement général de l'intelligence que l'on permet à l'enfant d'accéder éventuellement à un niveau donné. On travaille donc un peu dans l'espérance, tout en évitant les excès évidents.

Initialement, l'enseignement s'adresse aux choses, aux processus molaires, et on avance à mesure que la perception se raffine. L'engagement du cortex est plus facile sur le plan des réalités concrètes. Après, on passe aux relations choses-mots (oraux). Une fois que les choses sont connues, on peut en parler, même sans l'appui immédiat des choses dont il s'agit. Mais les mots, comme symboles des choses, sont plus difficiles à percevoir; le renforcement, quoique fréquent, est plus fragile. On fait le nécessaire pour intensifier la perception. On parle plus lentement, avec une diction plus marquée, en évitant les homonymes, en augmentant le contraste entre les mots.

L'apprentissage de la lecture se planifie avec encore plus de soins. Ici le renforcement est moins fréquent. Il faut donc que la perception soit plus frappante. On commence avec des mots familiers, qui font appel aux émotions, tels le plaisir, les compliments. On progresse lentement; on ne dispense pas trop de vocabulaire à la fois. On doit se souvenir que chaque mot devient une habitude spécifique. Quand on initie l'implantation de plusieurs habitudes simultanément, on peut s'attendre à des réactions de confusion. L'apprentissage du mot écrit est difficile, d'abord parce que les renforcements sont rares, mais aussi parce que le mot écrit est éloigné de l'objet par deux étapes, ou à travers le mot oral. Le symbole écrit est restreint en étendue et donc mal adapté aux exigences du système nerveux central.

A la lumière de la théorie et des méthodes suggérées jusqu'ici il est clair que l'enseignement sensiblement individualisé est de rigueur pour le déficient mental. Les différences individuelles sont souvent énormes, et il y a une grande variété de difficultés, qui peuvent surgir de dommages cérébrals ou de contretemps émotionnels. Il faut s'adapter à chaque situation.

Mais le point le plus important est de commencer l'éducation aussitôt que possible. Quand on n'apprend pas quelque chose, on apprend à ne pas l'apprendre. Il faut à tout prix établir et maintenir la flexibilité perceptuelle et conceptuelle, ainsi que psychomotrice et émotionnelle. Hebb a montré qu'une riche stimulation environnementale affecte le développement de l'enfant jusqu'au stade adulte. Il n'est pas du tout certain qu'en accordant le même avantage plus tard on produira les mêmes effets.

Il semble bien que le psychisme change beaucoup durant son évolution. La négligence peut l'amoindrir irrémédiablement. On dit, par exemple, que le déficient mental n'a pas beaucoup de curiosité. C'est peut-être parce qu'on n'a pas fait grand chose pour le stimuler. On parle d'étape dans l'évolution de la faculté cognitive chez l'enfant. Il n'y a pas d'évidence que les mêmes étapes se retrouvent chez les déficients mentaux; mais, ici encore, peut-être que l'on ne s'attarde pas assez à le stimuler adéquatement.

Chaque fois que l'on regarde un déficient mental, on peut légitimement se poser des questions sur les conséquences de son dommage neurologique et les conséquences du dommage infligé par la société qui refuse d'exploiter les exigences de son état et de ses capacités résiduelles.

Il semble que le point de vue à favoriser dans l'éducation du déficient mental consiste à mettre en oeuvre sa motricité, sa capacité de ressentir et d'agir, ses sens, plus particulièrement le sens kinesthésique. Le déficient mental apprend, semble-t-il, surtout par ses membres; il possède de grands talents dans ses mains et dans ses pieds.

ACTIVITE PHYSIQUE ADAPTEE CHEZ LES DEFICIENTS ORGANIQUES / ADAPTED PHYSICAL ACTIVITY TO THE ORGANIC DEFICIENCIES

The role of physical activity in the treatment of diabetes

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Introduction

Diabetes Mellitus is a disease that afflicts people of all ages and has been traced to two main causes: heredity and stress. The disease seems to be due to a genetic disorder, the exact defect of which remains unknown. In 19 to 41% of patient that are treated for the disease there is a history of this endocrine disorder. Also approximately 25% of close relatives of diabetics have abnormal glucose tolerance test as compared to 2% of the controls.

During the early phase of genetic diabetics, the indications are that an excessive amount of insulin-like material is secreted, but the rate of secretion during the first half hour after glucose administration tends to be decreased. There are indications that many cases of these subjects do not respond as well to the amount of insulin-like material in the plasma as would be anticipated.

Accumulated experiences have suggested that severe stress upon the body may bring to light a diabetic state but only if an underlying predisposition exists. Some of the precipitating factors may include: (a) high caloric intake; (b) obesity; (c) pregnancy; (d) infection; (e) thyrotoxicosis; (f) pancreatic disorders; (g) hyperglycemic states due to endocrine disorders; (h) disorders of the nervous system.

Major types of diabetes

Two distinct types of diabetes have been identified: juvenile onset and adult onset.

Juvenile diabetes is often defined as diabetes with onset before the age of 15. It is characterized by rapid onset and rapid progression to coma. It seems to affect boys more severely than girls as the insulin requirement of adolescent boys is greater than that of adolescent girls, particularly during the interval of growth spurt.

The peak age for the onset of juvenile diabetes is approximately 10 years in girls and 13 years in boys.

In adult onset diabetes the prevalence increases rapidly with age reaching a peak in the 65 to 74 years age group. Also approximately 10 times as many cases are diagnosed in persons over the age of 45 as in those under it.

There is a somewhat higher incidence for women than for men, but it is only after the age of 65 that the discrepancy becomes marked. Also the low income group seem to be more affected by the disease. Among people who are more than 50% overweight, the incidence of the disease is seven times greater than normal people. The highest incidence occurs among those who are obese and have a family history of diabetes.

Symptoms of diabetes

Among the most frequent symptoms stated for the disease one can list the following: (a) polyuria; (b) polydipsia; (c) polyphagia; (d) weight loss; (e) loss of strength; (f) repeated skin infections; (g) headaches; (h) drowsiness and malaise.

Obesity and diabetes

It has been shown that two thirds of those with adult onset diabetes are obese and tend to remain obese. In young diabetics the incidence of obesity is increased but very slightly, however, in adults, the greater the obesity the higher the incidence of diabetes. Obesity is conducive to a variety of organic disorders and in the case of diabetes it was found that the mortalitv was eight times as high in diabetics who were 25% or more overweight as in those of normal weight.

Diabetics and personality

The physical activity specialist will have to cope with three major personality associated with diabetic patients.

The dependent patient will need moral support and for that reason the instructor must be tolerant. Friends and relatives are needed to motivate the patient.

The disciplinated diabetic adheres to established routines, and needs to be convinced with scientific evidence. This patient usually likes to help in the administration of the fitness program. He does not get emotional but rather reasons things out.

The emotional patient will be dependent upon the group and tends to react very emotionally to simple symptoms. This individual is inclined to believe mostly everyone about the condition of his disease.

Insulin and hormonal interplay during physical work

One of the first striking evidence to demonstrate the effect of physical exercise on insulin secretion was performed by Ingle and collaborators (1951). The pancreatectomized rats which he used were divided into three groups. One group received insulin only but did not perform any physical work, a second group worked but received no insulin, while a third group did work and also received insulin infusion. The investigators could show that the blood glucose level was reduced in the three groups but more so in that group which performed the work and also received insulin infusion.

In the same experiment it was shown that those rats which received insulin did not perform as much work as those which worked only.

This experiment showed two things: (a) that physical work was a factor that could reduce blood glucose thus replacing partly the necessity for insulin; (b) that insulin seems to hinder the work output or efficiency. Seemingly insulin would favour the same metabolic routes as glucose.

A series of experiments thereafter followed until Golstein (1953) brought forth the theory that during muscular work a humoral factor would be released by the working muscles and which would facilitate the entry of glucose into the working cell. The same experiments had demonstrated earlier that some sugars were more responsive to muscular work.

Métivier, Poortmans, Vanroux et al. (1971) also showed that during muscular exercise of various intensities insulin seems to be very ineffective in controlling the glucose level in the blood.

The work of Pruett (1970) showed beyond the shadow of a doubt that the same pattern holds true during intermittent work performed for a long period of time. According to this investigator three aspects of carbohydrate metabolism during prolonged physical work were elucidated.

1. A fall in blood glucose concentration could not be due to an increased plasma insulin activated by work, since plasma insulin concentration invariably fell.

2. Some regulatory mechanism other than blood glucose concentration must have been involved in governing the concentration of circulating plasma insulin, since plasma insulin concentration decreased whether blood glucose concentration decreased or not.

3. Possible mechanism for the preservation of lever glycogen stores or metabolism of the CNS maybe indicated, namely that low plasma insulin concentration might act as partial barrier to the transport of glucose into the muscle cells.

The factors which cause a drop in blood insulin level during physical work are now known to a certain extent. Baum and Porte (1969) while working with young puppies created an artificial state of hypoxia in his animals and observed an increased in blood glucose level accompanied by a decrease in insulin. This investigator suggested that the state of hypoxia which develops during physical exercise could bring about a sudden drop in insulin and consequently a rise in the glucose curve.

The work of Wright and Malaisse (1968) pointed out very clearly that the catecholamines were capable of blocking secretions from the beta cells. Also, mostly all forms of physical exercise are accompanied by varying degrees of adrenalin secretions. Kaki (1956) showed for instance that young gymnasts who practiced for competitions increased their levels of urinary adrenalin sixfold after a 45-70 work bout. The work of Elmadjian, Hope, et al. (1958) is particularly interesting. This investigator studied hockey players and boxers. He reported sixfold increases in non-adrenaline in hockey players during a competition. A player who was involved in a fight reaches a twentyfold increase. Boxers seem to be more affected before the fight.

Marginal diabetics seem to respond more favorably to physical exercise than those patients who suffer to a greater degree. In effect Moxness, Molnar, and McGusksin (1964) showed that those dogs who were made diabetic and which had relatively low blood glucose levels could respond better to exercise than those which had very high values.

Growth hormone and insulin

Since insulin is not an hormone particularly active during muscular work some other substance must be involved if the activity is to continue. Growth hormone has been attributed a major role in the regulation of fuel for muscular work and the mechanism which controls the release of this substance may be hypoglycemia, hyperaminoacidemia, stress, hypoxia and the stress of muscular work. Schalch (1967) has demonstrated that either during competitive or non-competitive physical activities growth hormone is credited. Also it is well known that this hormone has for effect the mobilization of FFA which can be used for fuel during muscular activity. Seemingly this hormone is secreted after 10 minutes of work and is proportional to the intensity of work. It is not impossible also that this hormone acquires insulinic properties during muscular exercise. The threshold to be attained before it is secreted may be between 50 and 66% of MVO_2 according to data collected by Métivier, Poortmans, and Vanroux (1976). As hypoxia inhibits the secretion of insulin, it serves as a stimulus for the production of growth hormone.

The Golstein effect

It may be that the humoral factor as presented by Goldstein is in effect insulin which is synthesized by peripheral tissues. It is a known fact that the endocrine glands are equiped to synthesize and store hormones but other tissues have the enzymatic mechanism to synthesize hormones. Such is the case of thyroxine which can be synthesized from a certain amino acid, thyrosine and iodine by certain tissues other than the thyroid gland. Also in juvenile diabetics a insulin-like substance is secreted and which has not been identified as being a true nature insulin.

What exercise for who

Since it is difficult to assess accurately the severity of diabetes in youngsters before puberty it is advisable to experiment quite deligently the exercise regimen and the insulin prescription. More precisely the diet should be well controlled in order to circumvent serious organic disorders. It is not advisable to replace the medication by exercise but it is recommended that if the medication is decreased, the exercise prescription should be increased along with an increase in dietary proteins to approximately 20-25% of the total diet.

In the case of adults who are receiving a daily dosage of more than 42 units of insulin the exercise regime could be very difficult to prescribe since some of those patients may respond favorably while others will not. In the latter case in no instance should the medication be withdrawn. Many of those patients who receive less than 42 units respond favorably to exercise and a 10% weekly reduction of insulin may be made along with the exercise regime until the blood glucose level has leveled off. Also in some of those patients a further reduction in insulin is recommended during those days in which the patient is very active physically.

Exercise regime

The bicycle ergometer has proven very successful in training diabetics because it can be regulated easily and does not offer accidents situations. The load can be initiated at 0.5 KP for 15 minutes 3 times during the first week and followed by 30 minutes bout the second week. Thereafter the resistance can be increased progressively to 1 KP, 1.5 KP, 2 KP, etc...

Simple free exercises can also be prescribed during the initial period of two weeks along with easy jogging for about 50% of the predicted maximal heart rate. After six weeks of the conditioning program the patient should be able to attain at least 50% MVO_2 and 2/3% MVO_2 after 3 months.

Precautions

It is of utmost importance when prescribing exercise to diabetics to evaluate before the program the degree of adiposity of each patient. If at any time during the exercise program the lean body mass decreases a readjustment of the prescribed program is necessary.

A first aid kit including sugar beverages and heavy syrup should be present at all times. Should the patient enter a state of hypoglycemia the heavy syrup should be placed between the gums and the cheeks.

Since the diabetic is infection prone, it is of utmost importance to use clean and safe equipment. The gymansium floor must be clean and possibly desinfected before the exercise period.

Finger and toe nails should be cut regularly and especially before the physical activity period. Contact sports should not be encouraged because of the high risk of injury which may take considerable time to heal in those patients.

Because the diabetic person may enter hypoglycemia following the exercise period it is recommended that a buddy system be initiated whereby person observes themselves mutually for a period of at least 30 minutes following the activity period. At no time should the diabetic lock the door while using the washroom. Also tandem exercises are not recommended because of the possible risks of injury.

Since vascular disorders usually accompany diabetes, it is recommended that patients abstain from performing valsalva manoeuvres. "Duck Walk" could be injurious therefore should be avoided.

New horizons

Recent studies point out that a high protein diet may be a possible solution to control elevated blood sugar levels. It has also been shown that prolonged consumption of fibre-depleted starch is conducive to the development of diabetes mellitus in susceptible genotypes. Furthermore, a 75% carbohydrate diet with generous amounts of diatery fiber may be a treatment of choice for mild to moderate diabetic patients who are prone to develop both hyperlipidemia and atherosclerosis.

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Obesity and exercise

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Surplus food intake leads to accumulations of fat, which can only be removed by surplus physical activity. Dietary controls prevent further accumulation but what is there, must be metabolically burned off. Cold exposure and exercise are the only significant factors leading to increased energy expenditure. Shivering is seldom sustained, leaving exercise as the important factor to balance the energy intake or to imbalance that which has already been stored.

What is human fat?

The human body converts a portion of the ingested food to fat (mixed triglyceride) and stores it in a fat cell, as palmitic and oleic acids primarily. Fat occupies less volume, and weighs considerably less per calorie than carbohydrate or protein. This greater caloric density effects a weight economy (e.g., a 70 kg man, with a caloric reserve equal to 10% of his fat stores would weigh twice as much). The fat cell is a highly differentiated cell, even in the embryological state. It is extremely active, requiring nerve and blood supply. Fat cells tend to be spherical, when they are crowded together, they deform one another. There is some variation in fat cell size inter-individually and intra-individually. There is no significant difference in the composition of fat in different regions of the body. Human fat is yellowish in colour, nearly liquid at body temperature and has a density of .92. The conversion of CHO to fat takes place in the cell itself (lipogenesis). It's believed that the fat cell has two compartments: one relatively inert, the large one, and one where there is a rapid turnover, the smaller one.

Fat leaves the cell as a free fatty acid, due to stimulation, hunger, muscular activity, or cold, demonstrating the requirement for a nerve supply (sympathetic - adrenal regulation). Groups of fat cells, adipose tissue are located throughout the body. The number of cells, and their location appear to be genetically influenced. Increase in the number of fat cells (hyperplasia) is suspected, and if it occurs, it takes place relatively early in life.

Purpose or need of fat

The prime purpose of human fat is energy storage. As a reserve, it stabilizes the supply of energy (although one would wonder why a person needs to carry a 30 day reserve). Fat acts as an insulator. It reduces heat loss. More than that, it generates heat, like an electric blanket. It gives shape to the body. It has aesthetic value. The right amount of fat gives smooth contours, rather than angles or projections. However, excessive fatness, obesity, will hinder physical performance because it is a mechanical burden. If often alters the shape of the body to one that is undesirable. Those who are overly fat are more likely to develop cardiovascular renal diseases, diabetes, etc... (i.e., increased morbidity), and there is a higher mortality among the overly fat. In some cases, it leads to psychological problems.

Body fat distribution (fat patterning)

Fat tissue is distributed throughout the body. The major amount is in the subcutaneous tissue and can be viewed as an exterior coat or cloak of fat. It is thinner in some places, and thicker in others. Males exhibit a particular pattern of distribution, different from women (vive la différence). Women have more fat on their extremities, upper arms and upper legs, whereas men have more on their trunk, chest, back and hip. Research in our laboratory indicates that it is an individual pattern. It also appears that with fat loss, relative fat patterns are maintained.

Measurement

The thickness of the subcutaneous layer of fat is measured with a specially designed caliper, the Harpenden skinfold caliper. Subcutaneous fat sites are selected first to accurately depict the fat pattern, and secondly to be used to predict all of the fat for that individual. More sites, rather than fewer, are necessary when dealing with an individual, so that the individual differences are represented and for the accurate prediction of his total body fat. In longitudinal studies the larger number of fat sites would be valuable in the study of possible changes in fat distribution. For research purposes the following sites are recommended: bicep, tricep, chest, subscapular, suprailiac, umbilical, front and rear thigh, calf, lower and upper medial thigh.

Total body fat is calculated from determinations of body density, on the assumption of a standard density of the fat free body mass. Changes from the standard body density are considered to be due to the fat mass. In practice, the percentage of the body mass which is fat, is predicted from a number of the subcutaneous fat thicknesses.

Women, on the average, have more fat than men. Thirty-five to 45 year old women have 25% and men have 18% of their weight as fat, whereas 18 to 25 year old women have 18% and the same age males have 13%.

How much should one have?

The relative amount of optimal body fat should be an individual matter based on the following criteria: appearance, performance, general health, body type, cultural influence, and personal preference. A person is fatter than he ought to be if he is above the average values for his age and sex. A man is obese when his relative body fat exceeds 30% of his body weight. Since women are fatter than men, the obesity percentage is probably 35% for females (the fattest woman I've measured weighed 416 lbs.and her body density indicated that she had 60% of her weight as fat).

Role of exercise

If you have more than you would like, what can you do? You can burn it off, and you can prevent further accumulation. There are some things you can't do. You can't 'melt if off' ...in a hot environment such as saunas, and steam baths. You can't 'shake it off' ...with mechanical vibrators, or massage. And you can't select specific fat sites for preferential treatment by special exercises on the hope that you will lose from one site and retain fat at others. Spot-reduction does not work.

The principle

Muscular contractions use glycogen and free fatty acid, and therefore leads to expenditure of the stored energy. Large muscular contractions over long periods of time means a large energy expenditure. The base line of energy expenditure, sitting, is less than two calories per minute for a 70 kg man. Energy expenditure can increase tenfold, with very strenuous physical activities. Moderate levels of 3 or 4 times base line values are not excessive and can be continued for relatively long periods of times. Therefore, if large muscle groups are utilized to move the total body mass, at moderate levels of exercise intensity, over relatively long periods of time, the greatest energy expenditure will result. Heavier subjects will expend more energy for the same work intensity than lighter ones.

The exercise prescription

Frequency. Regular, daily, 5 to 7 times a week.

Type. Large muscle mass activity, walk, jog, hike, bike, skate, ski, skip, dance, walk up hill or stairs, swim or run on the spot.

Duration. Relatively long periods of time, 30 minutes or more.

Intensity. Low to moderately vigorous, suitable to the fitness level of the individual.

The problems

Schools impose a sedentary existence upon us from a relatively early age. Television has us in its grasp, and as soon as we are able, we ride wherever we have to go. Cultural factors tend to favour physical inactivity. Caloric intake is fun, easy, attractive, and we're constantly and continually exposed to advertising, particularly the high caloric foods.

By the time obesity becomes a problem, our diet and activity habits are fairly well ingrained, and therefore difficult to alter. There is no single or simple answer to obesity. There are multiple causes. Determining what is best for the individual, may not be an easy matter. Obesity may have a metabolic cause. Inter-individual variability in metabolism is recognized. It may have a psychological cause. A traumatic event may put us on the road to obesity. Our socio-economic status may lead us to obesity, while lack of physical activity can also be cited. Obesity is self perpetuating. Fat parents produce fat offspring. The obese are usually low in fitness, therefore it's difficult to impose enough exercise to be of immediate value. Excess fat is a handicap or burden to physical work and is therefore difficult and often avoided.

The research

Gwinup (1975) exercised by walking, 29 obese females, who were resistant to conventional dieting, one half an hour a day, for a year without a change in diet. Eleven women persisted in the program, and had a mean weight loss of 22 lbs, ranging from 10 to 30 lbs.

Mayer (1968) concluded that the difference between lean and fat adolescent girls wasn't their food intake, but their level of physical activity.

Parizkova (1963), in a 5 year longitudinal study showed that the more active young men and women became leaner than their less active colleagues. Many studies of middle aged men and women show decrements in fatness with exercise. In most cases the lean body weight increases in weight or remains the same. It's important to recognize that exercise activity preserves the lean tissue. With habitual rigorous exercise, there's a suggestion that appetite is suppressed. Increased appetite is not necessarily a function of increased activity.

The exercise solution

As a preventive measure, exercise activity should be initiated early in life in order to prevent the gradual accumulation of fat, and also to institute or develop a long lasting activity habit pattern.

Secondly, many individuals, particularly the obese, should be reactivated to normal levels of physical activity. They should walk around the house, up and down stairs, in and out of doors, to and from work, or school. Thirdly, the obese should increase their normal forms of physical activity. The use of stairs, instead of elevators, walks around the block, walks around the house during commercial T.V. breaks, etc... Finally, supplemental physical activity will likely be necessary and must be tried. Physical fitness activities individually prescribed, suited to the individual and his level of physical fitness is recommended. The starting level should be low and well within the individual's capabilities. The progression should be slow, and the pace within one's capacity. The frequency should be daily, and the activity should be simple - one that everyone can do. Walking itself is good, because the person must move his own body mass. Walking uphill or up stairs is more energetic and such activities should be included in the activity prescription. The behavioural modification objective in respect to exercise activity certainly isn't easy but when achieved, the rewards are very gratifying.

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ACTIVITE PHYSIQUE ADAPTEE CHEZ LES DEFICIENTS PERCEPTUELS / ADAPTED PHYSICAL ACTIVITY TO THE PERCEPTUAL DEFICIENCIES

Disturbances to limb praxis: A new look[1,2,3]

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Apraxia is a term first used by Steinthal (1871) to describe a variety of pathological conditions resulting from brain damage which involve the inability to carry out purposive, voluntary movements in the absence of motor paralysis, ataxia, or dimentia. While many forms of apraxia have been described (Brown, 1972; De Ajuriaguerra & Tissot, 1969; Geschwind, 1975; Neilsen, 1946), the focus of this paper is only on those which affect the praxis of limb movements. Further this paper is primarily directed at a discussion of symptoms surrounding damage to the cortical grey areas rather than to the underlying white matter although it is certainly recognized that in many types of brain disease and trauma damage to both areas may be implicated. In essence, then, this discussion is concerned with so-called "cortical syndromes" in which damage to the upper cortical mantle is involved rather than with "conduction" or "disconnection" syndromes associated with white matter damage in which the intact cerebral areas are disconnected. An excellent account of these latter syndromes is provided in works by Gazzaniga (1970), Geschwind (1965), and Nebes (1974).

In this article a brief description of the clinical symptoms surrounding each type of apraxic syndrome is followed by a careful reexamination of these apraxias from three perspectives: in terms of the pattern of movement disorders evident in each apraxic syndrome, in terms of the secondary symptoms associated with each apraxic disturbance, and in terms of the site of cortical brain damage. Using information gleaned from this analysis a typology which emphasized the basic functional disorders underlying apraxia is developed. A discussion then follows which considers how this typology relates to recent evidence pertaining to the cerebral laterality of motor functions (Kimura & Archibald, 1974; Lomas & Kimura, 1976; Roy, 1976), how it can be used to more effectively study apraxia and develop treatment regimes for the apraxic patient, and what implications this typology has for models depicting the organization of motor skill.

Classical syndromes of apraxia

While some time could be spent recounting the development of clinical investigation into apraxia, more fruitful discussion can be devoted here to examining the symptoms associated with each of the several reported syndromes of apraxia. An historical perspective to this area can be gleaned from among other sources, Brown (1972), De Ajuriaguerra and Tissot (1969), Neilson (1946), or Warrington (1969).

Liepmann (1908, 1920) was one of the first workers to describe apraxic disturbances. He proposed three types: ideational, ideomotor and limb-kinetic. The limb movement disorders in the first and second types were characterized by a difficulty in sequencing movements so as to develop a coherent movement pattern (e.g., lighting a cigarette), while the last type involved a difficulty in executing isolated movements within a sequence leaving the sequencing of those movements unaffected.

Ideational and ideomotor apraxia both involved bilateral damage to the parietal-occipital areas of the cerebral cortex; however, the damage in ideational apraxia was usually greater. Both were often associated with spatial disorientation but very seldomly with disturbed intellectual organization or planning. Limb-kinetic apraxia, on the other hand, involved damage to the precentral motor cortex and was often associated with loss of strength but rarely with either spatial disorientation or disorders in intellectual planning.

Three other forms of apraxia have been more recently discussed by Luria (1966). Two types, frontal and premotor apraxia, display disordered limb movements similar to those seen in ideational and ideomotor apraxia, that is, improper sequencing of movements. In these cases, however, perseveration, the persistance of a previous movement in the sequence, especially in frontal apraxia, is more prevalent. Frontal apraxia involves bilateral damage to the prefrontal area of the cerebral cortex. It is often associated with disorders in intellectual planning but rarely with spatial disorientation. Premotor aprazia, on the other hand, involves damage to the premotor area and is rarely associated with either spatial disorientation or disordered intellectual planning.

The third type of apraxia described by Luria (1966) is termed kinesthetic apraxia. This apraxic disturbance is similar to limb-kinetic apraxia identified by Liepmann (1908) in that isolated movements in a sequence showed an ataxic-like disturbance leaving the sequencing of the movements quite intact. This apraxic disorder is associated with damage to the post central motor cortex (i.e., sensorimotor cortex), and is often associated with loss of kinesthetic sensitivity, but rarely with spatial disorientation or disturbed intellectual planning.

The final type of apraxia associated with disordered limb praxis is termed constructional apraxia. It was first described by Kleist (1934) and has, subsequently, been extensively examined by others (e.g., Arrigoni & De Renzi, 1964; Benton, 1962; De Renzi, Faglioni & Spinnler, 1968; Paterson & Zangwill, 1944; Piercy, 1964; Piercy, Hecaen & De Ajuriaguerra, 1960; Piercy & Smyth, 1962; Warrington, 1969; Warrington & James, 1967; Warrington, James & Kinsbourne, 1966). Constructional apraxia appears to represent a disorder specific to movements under visual control, particularly affecting the spatial components of the task. It is readily apparent in all constructive tasks (e.g., drawing, block design) which involve the representation of objective space. In drawing tasks perspective disappears and is replaced by inaccurate projection of planes akin to that observed in drawings made by a child. The patient is unable to articulate the parts of even a slightly complex figure (e.g., a two dimensional drawing of a house).

Constructional apraxia is associated with damage to the parietal-occipital areas of the cerebral cortex and appears to be qualitatively different depending on which hemisphere of the cortex is involved (see Warrington, 1969 for a discussion of these differences). Further, it almost always is associated with spatial disorders such as right-left disorientation, poor topographical memory, and dressing apraxia but rarely with disturbances to intellectual organization or planning. Also De Ajuriaguerra, Hecaen and Angelerques (1960) showed that 74% of those with constructional apraxia also manifested signs of ideational or ideomotor apraxia.

A need for a reconsideration of apraxia

While many types of apraxia have been described over the years, we do not seem to be any closer to an understanding of the true nature of this syndrome. We know that disorders in the execution of motor acts are involved. This observation, however, is merely a manifestation of more basic, underlying disorders. Is apraxia really a unitary disturbance which, as De Ajuriaguerra and Tissot (1969) suggest, does not bear any relationship to the site of brain damage? More importantly, are all the apraxias reported above exemplars of a common underlying disorder in some single function? Since all skilled human activities, of which motor skill is typical, have been thought to involve complex functional systems organized hierarchically (e.g., Jackson, 1932; Luria, 1966, 1973a; Marteniuk, 1976a, 1976b; Paillard, 1960), it seems possible that brain damage may selectively disturb one of the elements or components of the functional system while leaving others intact. Further, since the notion of mass action or equipotentiality (Goldstein, 1942; Lashley, 1931; Zangwill, 1961) as a description of cerebral brain organization has been rejected in favor of the notion of dynamic localization or pluripotentialism (Luria, 1966, 1973a), it seems possible that the basic elements in the functional system comprising skilled motor behavior may have identifiable neural substrates. Indeed, examination of disturbances in language skills indicates that aphasia can be categorized into disorders in various basic underlying functions which have been shown to have clearly discernible neurological substrates (e.g., Brown, 1972, 1976; Head, 1926; Kertesz & Benson, 1970; Kertesz & Poole, 1974).

Consideration of this evidence suggests that we must reconsider apraxia form the standpoint of a disturbance to a complex functional system, skilled human motor behavior. A reanalysis of apraxia based on this interpretation may facilitate a better understanding of the nature of the syndrome through the development of a more coherent classification or typology of apraxia. A clearer classification scheme for apraxia may foster a more lucid comprehension of how to develop treatment regimines for the apraxic patient and of how motor skill may be organized in the cerebral cortex.

A reanalysis

Attempts at defining a typology of apraxia have been made over the past half century. For example, Hecaen (1968) characterized the apraxias in terms of disturbances of particular types of symbolic activity, while De Ajuriaguerra and Tissot (1969) discussed apraxias in terms of the Piagetian concepts relating to the acquisition of space. Few, however, have specifically tried to typify the apraxias in terms of the basic functional processes thought to be disturbed. Although Denny-Brown (1958), Luria (1966), and Liepmann (1920), have all discussed apraxia from this perspective, work remains to be done in order to more clearly understand the organizational disorders underlying apraxia.

In examining the various apraxic syndromes, De Ajuriaguerra and Tissot (1969) could find no clear relationship between area of brain damage and type of disturbance to limb praxis. This led them to state that the symptomatic structure of apraxia may be due more to the mass effect of the lesion than to its strict localization. While this statement may be true, it obscures meaningful interpretation of apraxia. Rather than taking such an uncritical view, it would seem more to the point to try to analyze these pathological behavioral syndromes discussed above from three perspectives: (a) in terms of the nature of disturbance of limb praxis, (b) in terms of the known functions of each of the cortical areas which has incurred damage, and (c) in terms of the secondary disorders associated with the disturbance of limb praxis. This type of analysis has been done and is presented in Table 1. It represents a synthesis of the symptomology presented in the previous section.

In examining Table 1, it is remarkable that although there are several types of apraxia noted, two characteristic movement disorders seem to be present; (a) an inability to properly sequence movements

Table 1

A synopsis of apraxic syndromes

Clinical symptoms	Type of apraxia					
	Ideational	Ideomotor	Frontal	Premotor	Limb-Kinetic	Kinesthetic
Characteristics of disordered limb praxis						
Preseveration	X	X	X	X		
Improper sequencing	X	X	X	X		
Difficulty in initiating movement		X	X			
Difficulty in terminating movement			X	X		
Disturbance of individual movements in a sequence					X	X
No improvement with object use	X					
No improvement with imitation	X					
Poor reproduction of limb position						X
Associated symptoms						
Spatial disorientation	X	X				
Difficulty in cognitive organization and planning			X			
Loss of strength					X	
Loss of kinesthetic sensitivity						X
Areas of brain damage						
Parietal	X	X				
Occipital	X	X				
Frontal			X			
Premotor				X		
Precentral motor					X	
Postcentral motor						X

involving to some extent perseveration on a particular component or unit with the sequence (i.e., ideational, ideomotor, premotor, and frontal apraxia) and (b) an inability to adequately perform the components of a movement sequence while leaving the sequence itself intact. A closer look at these movement disorders as they relate to site of brain damage and associated secondary symptoms reveals a very interesting pattern. The first disorder (i.e., sequencing) involves damage to the frontal, parietal or premotor areas and is associated with either disordered spatial orientation or disturbed intellectual planning. The latter movement disturbance is associated with different secondary symptoms and site of brain damage, i.e., loss of strength or kinesthetic sensitivity and damage to the pre- or postcentral primary motor areas of the cerebral cortex. This differential pattern of symptoms strongly suggests that these movement disorders may be subserved by different functional disturbances. Indeed if we consider what is known about the functions of the damaged cerebral areas a relatively clear interpretation emerges.

The frontal areas have been implicated as important in the control of behavior. For example, in primates damage to the prefrontal areas, especially the dorsolateral surfaces, has been associated with a gross impairment in changing from one behavioral set to another (e.g., delayed alternation tasks (see, for example, Mishkin, 1964; Oscar-Berman, 1975; Pribram & Luria, 1973) and in processing the consequences of their behavior (i.e., using reinforcement) during learning (e.g., Pribram, 1961, 1973). In humans a similar pattern emerges in that poor performance is seen on card sorting tasks requiring a shift in set from one stimulus category to another (e.g., Milner, 1964). Moreover, these patients show a marked lack of purposive, goal-directed behavior (e.g., Luria, 1966, 1973a). Accordingly, the frontal areas in humans have been implicated as important in planning (Luria, 1966, 1973a, 1973b; Nauta, 1971). The premotor and primary motor areas, on the other hand, have been shown to serve primarily an executive function with little role in planning behavior (Allen & Tsukahara, 1974; Eccles, 1967; Luria, 1966, 1973a).

Since the frontal areas may be important in planning and since this cerebral area's function in planning is based on information received from, among other areas, the parietal-occipital areas (Haaxma & Kuypers, 1974; McCulloch, 1944; Nauta, 1971; Netter, 1972; Pandya & Kuypers, 1969), damage to either the frontal or parietal-occipital areas could, due to their interdependence, conceivably involve a disorder in planning. Damage to the premotor or primary motor areas, however, might involve a disorder in executing as opposed to planning a movement sequence. In the following typology, then, movement disorders are characterized according to the supposed functional disorder, either planning or execution. This classification is further refined through the process of double dissociation in which consideration is again given to the site of brain damage and the associated secondary symptoms.

Planning apraxia

Planning apraxia (Table 2) is seen to have two subcategories: primary and secondary. This differentiation is based on the following double dissociation analysis (Teuber, 1955). While both frontal- and parietal-occipital-damaged patients display a marked inability to properly sequence movements (Table 1), the patterns of associated secondary symptoms is quite different. The movement disorder in frontal damage appears associated with a general cognitive-organizational disorder that is not restricted to motor behavior. These patients are unable to sequence or plan almost any activity whether or not it has a discernible motor component (Luria, 1966). Few reports of gross spatial disorientation have been reported. With parietal-occipital damage, however, the movement disorder is associated with a marked spatial disorientation but with very little cognitive planning disorder (Table 1). Damage to these areas, then, is thought to result in disturbances to different components of planning although the discernible movement disturbance appears the same (i.e., disordered movement sequencing).

Damage to the frontal areas is seen to result in primary planning apraxia (Table 2). Primary planning apraxia is thought to be a true disorder in planning since this area has been implicated in planning (e.g., Milner, 1964) and since patients having this damage possess a more general cognitive planning disorder. Damage to the parietal-

Table 2

A proposed typology of apraxia

Proposed classification	Previous classification	Area of brain damage
Planning apraxia		
Primary	Frontal	Prefrontal
Secondary	Constructional, ideational and ideomotor	Parietal-occipital
Executive apraxia	Premotor	Premotor area of frontal lobe
Unit apraxia	Limb-kinetic and kinesthetic	Pre- and postcentral motor areas

occipital area, on the other hand, is considered to result in secondary planning apraxia (Table 2). The disturbance in this case is not seen as a true or primary planning apraxia since a general disorder in planning activity, present as a result of frontal damage, is not evident (see Table 1). Although the sequencing of actions is definately disturbed, the source of this disorder is not thought to lie in an inability to plan per se; rather, because of damage to the parietal-occipital regions the spatial information sent to the area (frontal) responsible for planning is disordered resulting in the inability to properly plan motor behavior. Thus, the planning disorder is viewed as secondary to and a necessary result of a disturbance in spatial orientation and, as such, has been classified as secondary planning apraxia.

In terms of other typologies primary planning apraxia is seen as similar to Luria's (1966) frontal apraxia while secondary planning apraxia is seen to represent Liepmann's (1920) ideational and ideomotor apraxia and Kleist's (1934) constructional apraxia all of which can be attributed to a disorder in spatial abilities or spatial dyskinesia as Morlaas (1928, in De Ajuriaguerra & Tissot, 1969, p. 48) called it. Ideational and ideomotor apraxia are here viewed as a common disorder resulting from a common origin. To this observer, the only means for differentiating them is in terms of degree of impairment; ideational apraxia represents a more severe case of ideomotor apraxia in which there is impaired praxis to not only command, as in ideomotor apraxia, but alos to imitation and, ultimately, to object use (see Table 1). This common classification of these praxis disturbances originally thought by Liepmann to be distinguishable is in accord with other current suggestions (Denny-Brown, 1958; De Renzi et al., 1968; Hecaen, 1968; Zangwill, 1960).

With reference to constructional apraxia although the qualitative aspects of this apraxia have been seen to be different depending whether the damage is right-sided (spatial disorientation in reproduction) or left-sided (exaggerated simplicity) the disturbance is attributed to a common etiology: disordered spatial abilities in accord with Lhermittee & Trelles (1933). When the damage is left-sided the ability to analyze the model appears disturbed. It is suggested that this results in insufficient detail in the reproduction since the information available to the areas responsible for planning (frontal) and executing (motor and premotor) is inadequate. When the damage is right-sided, on the other hand, the ability to analyze the model is not disturbed. If anything, this process seems exaggerated since the patient has a profusion of detail. Rather, the ability to orient the movements into a coherent spatial pattern is faulty. This disburbance results in spatially disorganized, almost exploded, reproduction since the spatial information within which the areas responsible for planning organize the motor output is in gross disarray. Support for the suggestion that a common disorder may underlie ideational, ideomotor and constructional apraxia comes from the observation that 74% of those exhibiting constructional apraxia also showed symptoms of ideational and ideomotor apraxia (De Ajuriaguerra, Hecaen & Angelerques, 1960).

Executive apraxia

The second major classification in this scheme is termed executive apraxia (Table 2). This apraxia is seen to result from damage to the premotor area of the cerebral cortex. Although the disordered sequencing of movements seen as a result of frontal and parietal-occipital damage is also seen here as a result of premotor damage, the underlying functional disturbance is considered to be different in this case. Again based on the process of double dissociation it can be observed (Table 1) that the secondary symptoms associated with the movement disorder resulting from premotor damage are markedly different from those displayed as a result of frontal or parietal-occipital damage. Neither a general planning disturbance (frontal damage) nor a disturbance in spatial orientation (parietal-occipital damage) is associated with premotor damage. In addition, since this cortical area has been implicated in movement execution (Allen & Tsukahara, 1974; Eccles, 1967) and has rich cortical-cortical connections from the frontal area (Nauta, 1971), damage to it is thought to result in an executive disorder. That is, although the patient is able to plan the motor activity as the frontal areas are in tact and the pathways from the frontal to the premotor area are undisturbed, he is unable to execute the movement sequence properly due to damage to the area responsible for outputting the planned motor sequence.

That execution per se may be disturbed receives support from two other sources: work on stimulation of the premotor cortex and observation of apraxic performance of habitual skills in the proper contextual environment. Work by Penfield (e.g., Penfield & Rasmussen, 1950), among others, has shown that the premotor area subserves, not single isolated movements as in the motor cortex, but sequences of movements. For instance, experiments by Fulton (1935) and Wyss and Orbrador (1957) showed that stimulation of a particular part of the premotor region leads, after a long latency period, to the appearance of complex, integrated movements including rotation of the eyes, head, and whole trunk, followed by movement of the upper limb resembling a grasping action. Damage to the premotor area would, thus, seem to disturb the natural ability to execute a smooth, sequential movement pattern.

Evidence related to the performance of habitual skills provides even more compelling support for the notion that premotor damage leads to an executive rather than a planning disorder. Since habitual skills are highly overlearned, it follows that the commands for and, hence, the execution of these habitual actions may be preprogrammed. Further, evidence provided by Allen and Tsukahara (1974) suggests that preprogrammation may involve the premotor cortex in conjunction with the nuclei of the cerebellum. If this is so, habitual skills would seem to require very little planning since they are highly automated action patterns. One could predict from the above that only when damage to the preprogramming areas (i.e., promotor area) is incurred should these habitual skills become difficult to perform under all circumstances. This prediction is confirmed upon examining the different abilities of frontal and parietal-occipital patients versus premotor patients in the performance of habitual skills in a related context.

Following damage to the frontal area or to the parietal-occipital area, patients are usually able to carry out habitual skills (e.g., making the sign of the cross) in the proper context (e.g., in a church) but rarely when requested during a clinical examination. Upon damage to the premotor area, however, patients are unable to perform habitual skills even given the proper context (Luria, 1966). Since frontal and/or parietal-occipital damage does not involve the premotor area largely responsible for preprogramming motor activity, it is quite feasible that, given the proper context patient's incurring an injury in these areas should be able to perform habitual skills. On the other hand, it seems equally probable that damage to the premotor area itself should result in the marked disturbance of habitual skills even given the proper context since the area responsible for their programmed execution has been incapacitated. Even though the planning of behavior is not directly affected, these premotor patients remain unable to act out coherent movement sequences because of damage to the executory apparatus (Luria, 1966).

Unit apraxia

The final classification, termed unit apraxia (Table 2), is seen to represent disordered execution of individual movements within a sequence independent of the planning and execution of the movement sequence. That this syndrome differs from that involving premotor (executive apraxia), and frontal-parietal-occipital damage (planning apraxia) is evident from Table 1. First, damage in areas other than the pre- and postcentral motor areas results in disordered sequencing of movement while leaving the individual components of the sequence intact, while damage in the motor cortex precipitates poor execution of individual movements sparing the sequencing of those movements. Secondly, the pattern of associated secondary symptoms is different. Damage to the motor cortex results in either loss of strength (damage to to precentral motor cortex) or loss of kinesthetic sense with a concomittant inability to duplicate limb positions (damage to postcentral motor cortex) but does not include the symptoms of impaired spatial orientation, impaired intellectual planning, or perseveration evident in damage to the other areas.

Unit apraxia is seen to arise from damage to one of two areas of the motor cortex: precentral or postcentral. Damage to the precentral motor cortex resulting in what Liepmann (1920) called limb-kinetic apraxia involves an inability to carry out isolated movements since the cortical representing through the pyramidal tract is lost. Indeed, damage to this area has been said to result in "scotoma of action"

(Paillard, 1960). Damage to the postcentral motor cortex, on the other hand, resulting in what Luria (1966) called kinesthetic apraxia involves essentially the same disorder evident following precentral damage although for apparently different reasons. In this case, kinesthetic information necessary for the smooth control of movement is lost resulting in jerky, halting movements (Luria, 1966).

Discussion

The typology of apraxia developed here seems to provide a relatively clear means of classifying the apraxias. While former approaches have tended to be rather confusing, this system tends to be more objective thus enabling a more concise and precise classification. For example, ideational and ideomotor apraxia, previously seen as different, have here been classified as gradations of basically the same disorder since they both involve the same site of brain damage, and they both show a similar pattern of symptoms. Alternately, while frontal and premotor apraxia might be considered to be representative of the same type of disorder as they both exhibit similar movement disturbances, careful examination of the associated secondary symptoms as well as a consideration of the known function of these areas reveals that these movement disorders may be subserved by different functional disturbances. Frontal apraxia is seen here to involve a disturbance in planning in which the patient has lost the ability to conceptually organize the requisite movement sequence. Premotor apraxia, on the other hand, is viewed as a more or less pure executive disorder in which the patient is able to conceptualize (i.e., plan) the movement sequence necessary for accurate performance but lacks the ability to output the planned action into a coherent movement pattern.

In this system apraxia is viewed as a disturbance of a cognitive, information-processing system (Marteniuk, 1976a, 1976b) in which one or more of several basic functions may be in disarray. Damage to the frontal or parietal-occipital areas is seen to disrupt the planning function (c.f., Miller, Galanter & Pribram, 1960). A disorder in planning is considered to have two exemplars: a primary disorder (frontal damage) in which the cognitive component of planning is awry and a secondary disorder in which the perceptual component of planning is disturbed. In information processing terms (Fitts & Posner, 1967; Marteniuk, 1976a, 1976b), the former is a disturbance of the decision mechanism, while the latter is thought to involve a disruption of the perceptual mechanism.

Damage to the premotor or the pre- or postcentral motor areas of the cerebral cortex is considered to result in an executive disorder which in terms of the information-processing models involves a disturbance of the effector mechanism. This executive disorder is thought to be relatively independent of planning and is considered to comprise either an inability to properly sequence a number of movements (premotor damage-executive apraxia) or poor control over isolated movements or units within a sequence leaving the movement sequence relatively intact (pre- or postcentral motor areas - unit apraxia). Much insight into the neurophysiological basis of the execution of movement is afforded by the work of Brooks, Evarts, Towe and others (e.g., Brooks, 1969; Doetsch & Towe, 1976a, 1976b; Evarts, 1967; Evarts & Tanji, 1976; Towe, Whitehorn & Nygiust, 1968). Excellent reviews of much of this work can be found in Brooks (1969) Brooks & Stoney (1971), Evarts and Thach (1969), Evarts, Bizzi, Burke, De Long, and Thach (1972), and Kelso and Stelmach (1976).

Implications for the study and treatment of apraxia

This typology should conceivably provide a starting point for a more detailed analysis of apraxia than has heretofore been undertaken since a more precise method of classification is possible. Some direction is provided for an intense investigation of apraxic disorders associated with various cerebral lesions. By hypothesizing the relationships between site of brain damage and type of underlying functional disorder, work on more clearly identifying the praxis disorder can be made. For example, using techniques of cinematography and electromyography, one may reasonably attempt to identify movement disturbances characteristic of an underlying planning disorder when damage is in the frontal or parietal-occipital areas, while when damage is to be premotor area an attempt might be made to describe disturbed movement patterns characteristic of an underlying executive disorder. Movement parameters such as velocity, acceleration and sequence of muscle firing can be used in the foregoing analysis.

Alternately, one might consider manipulating relevant stimulus variables in learning a motor sequencing task in order to acquire a clearer understanding of the functional disorders underlying apraxia following injury to various sites in the cerebrum. For example, if parietal-occipital damage is associated with movement sequencing difficulties and impaired spatial awareness as suggested in this typology, then persons having this damage might have an inability to translate visual-spatial stimuli in the environment into a coherent movement pattern. Accordingly, one might predict that increasing the difficulty of this translation process by reducing the stimulus-response compatibility in a visually monitored movement sequencing task, would have a more marked effect on patients with parietal-occipital damage than on others with damage elsewhere.

Not only does this typology have implications for more clearly understanding apraxia it also may facilitate the treatment of the apraxic patient. Unlike neurological disorders resulting from subcortical, lower motoneuron or intramuscular damage which involve very few perceptual-cognitive disturbances apraxia which does involve such functional disturbances can prove particularly difficult to treat without some idea of the particular underlying functional process which has been undermined. It is proposed that if validated, this typology may aid immensely in identifying these disordered functions. For example, if the basic disorder is in planning, the treatment might involve teaching the patient the process of planning (c.f., Luria & Tsvetkova, 1964). This might take the form of requiring the patient to verbalize the steps necessary in executing a particular motor act without actually performing the movement. Following this training the patient might then be required to verbally describe each movement in the sequence while performing it slowly. Eventually, he would be taught to internalize the verbal commands and transfer them to other movements thus regaining the ability to plan.

Alternately, if the problem were primarily one of execution, the treatment might involve teaching the patient the proper means of executing the movement. The procedure here could involve attaching electrodes to the specific agonist and antagonist muscles involved in the particular movement sequence. The various electrical muscle potentials could be amplified and output as a series of musical tones. These musical tones may aid the patient in learning the proper sequence as they will act as a form of biofeedback. Through the process of learning the patient may attempt to reproduce the pattern of musical tones associated with the proper sequence of muscular firing. Biofeedback procedures have proven remarkably successful in the retraining of hemiplegic patients (e.g., Johnson & Garton, 1975) and, thus, may be helpful in the treatment of executive apraxia.

Implications for models of motor skill organization

A model for the organization of motor behavior may be developed from two distinct sources: from studies of the acquisition of motor skill and from studies of the disintegration of motor behavior following brain trauma. Both of these approaches provide clues as to how motor activity is organized in the skilled individual. Acquisition data provide evidence as to how a particular skill is integrated into a coherent pattern of goal-directed movements. Such data traditionally have formed the sole basis on which models of skilled performance have been developed. Data on the pathology of motor patterning following brain injury, however, have profound implications for such models. Indeed, any comprehensive model of the organization of motor skill must take into account both types of data.

Recently, models derived from work in the area of skill acquisition (e.g., Marteniuk, 1972, 1976a) portray an hierarchical organization from the overall plan of action to the specific subroutines involved in a single movement sequence. The overall plan directs the motor act in a wholistic fashion in that it sets the goal of the movement sequence and initiates the activation of various subroutines. These subroutines have, under their command, programs which involve the varied action sequences which go into executing the act. At an even lower level of the hierarchy are the individual movements within the action sequence.

In observing the patterns of pathology exhibited in these forms of apraxia one can readily see the analogy to an hierarchical model. At the summit of the hierarchy is the plan or schema (Pew, 1974; Schmidt, 1975) by which behavior is directed. An inability to effect the appropriate plan of action would result in the improper sequencing of the constituent movements while not necessarily affecting the individual movement components (Figure 1). It appears that this disruption of the planning of action may have a dual etiology: a true planning disorder or a secondary planning disorder.

At a somewhat lower level in the hierarchy are the various sequences involved in the execution of the plan. Here there might occur a derangement independent of either the plan or the individual motor components comprising the particular sequence. That is, selecting the correct plan so as to organize the action is intact, but the sequential ordering of the behavior is lacking. This disordered behavior exhibited in executive apraxia reflects this situation well in that only the sequential ordering of the action is affected.

Finally, the lowest level in the hierarchy is occupied by isolated movements which comprise the sequential patterns. Pathology in these individual actions independent of the higher levels in the hierarchy is characterized in unit apraxia.

The behavior exhibited by patients with apraxia provides strong corroborative evidence for the notion of an hierarchical organization of skill and suggests a model of motor skill performance like the one depicted in Figure 2.

At the summit of this model is a goal selector which selects the goal for the ensuing action. This selector is employed in situations when a decision must be made concerning the most appropriate goal to be pursued. Continual awareness of this goal throughout the subsequent motor activity provides the purposeful character of normal human motor behavior. Although a decision as to the appropriate goal is usually necessary, there are times when the context of a particular situation directly suggests the most appropriate goal thus removing the necessity

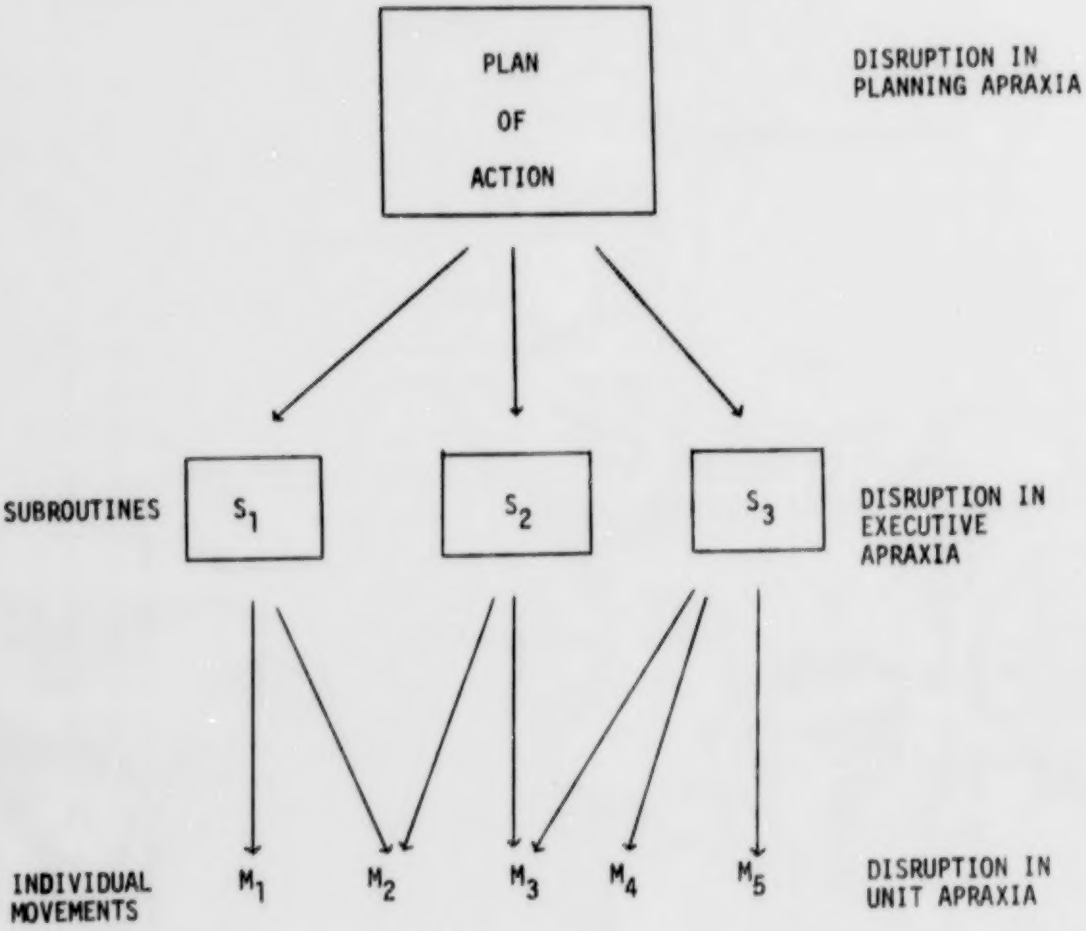
PLAN OF ACTION
DISRUPTION IN PLANNING APRAXIA
SUBROUTINES
S_1
S_2
S_3
DISRUPTION IN EXECUTIVE APRAXIA
INDIVIDUAL MOVEMENTS
M_1
M_2
M_3
M_4
M_5
DISRUPTION IN UNIT APRAXIA

Figure 1. Hierarchical levels of disturbance in apraxia.

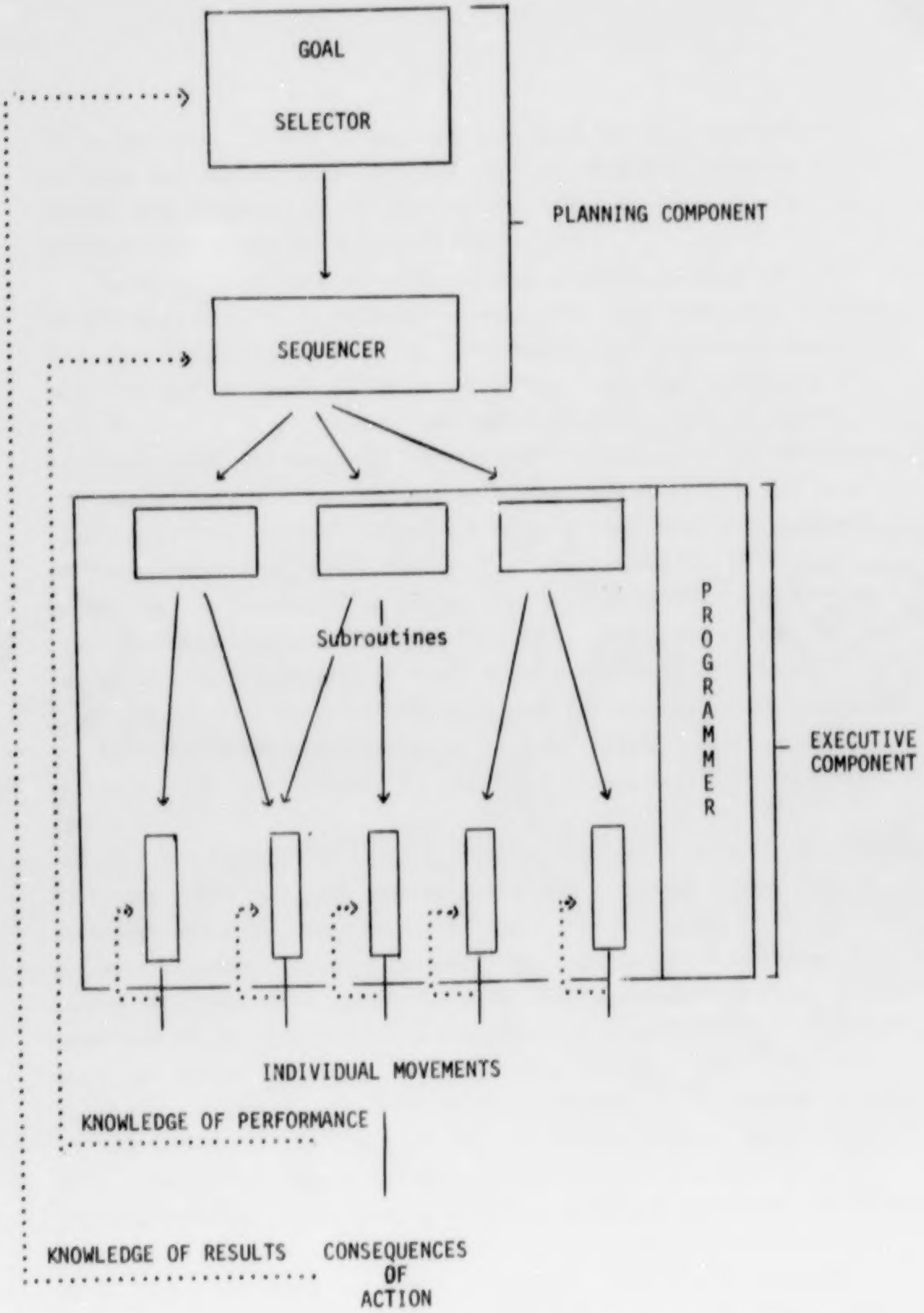
GOAL
SELECTOR
PLANNING COMPONENT
SEQUENCER
Subroutines
PROGRAMMER
EXECUTIVE COMPONENT
INDIVIDUAL MOVEMENTS
KNOWLEDGE OF PERFORMANCE
KNOWLEDGE OF RESULTS
CONSEQUENCES OF ACTION

Figure 2. A model of the organization of skilled motor performance.

for a decision. Indeed it has long been observed that some apraxic patients can successfully carry out habitual movement sequences in an appropriate situation or context but are unable to carry out the same movement when requested during an examination.

As a result of this striking paradox in motor behavior of some apraxic patients, it is proposed in this model that there be a distinction made between habitual (i.e., programmed, well-learned movement patterns) and non-habitual motor activities. Habitual activities are seen to involve very little in the way of planning, that is, making decisions about the sequential ordering of movements. These movements are seen as very well-learned patterns which can be carried out with little conscious control. Executive apraxia associated with damage to the premotor area which, through its interconnections with the cerebellum, is thought to be intimately involved in the motor programming of action sequences (Allen & Tsukahara, 1974), and is considered to represent a disturbance of these types of habitual activities. Indeed it has been observed that even when the goal selection processes are obviated through the availability of the proper context, these patients often remain unable to complete habitual activities (Luria, 1966).

For non-habitual or novel activities, on the other hand, planning decisions other than just goal selection are required. These involve decisions about the ordering of the individual movements or units in a movement sequence. Thus, a sequencer has been included in the model. In making decisions about sequential order the sequencer is thought to be comprised of two components: a cognitive (or organizational) component and a perceptual component. The cognitive component makes decisions about the sequential activities of many effectors. For example, directing the effectors (e.g., eye muscles) of various sensory receptors (e.g., the retina) toward the most salient stimuli provides for improved perception thus aiding in making decisions about the sequential ordering of the effectors (e.g., muscles) of various manipulative body parts (e.g., the hands and arms). Indeed, Pribram (1973) suggests that one of the functions of the frontal cortex may be to impose order upon both input and output (see also Luria, Karpov & Yarbuss, 1966).

The perceptual component, on the other hand, is thought to be involved in providing the visual-spatial information necessary for the decision processes carried out by the cognitive-component. A disruption in either one of these components is seen to result in poor functioning of the sequencer (i.e., improper sequencing of movements) and is here considered attributable to a disturbance in planning.

In this model, then, planning is thought to be required in non-habitual motor activities and is considered to involve two main processors: a goal selector and a sequencer. The former processor and the cognitive component of the latter are thought to be subserved by the prefrontal lobes, while the perceptual component of the sequencer is thought to rely on intact parietal-occipital lobes.

At a lower level in the hierarchy of this model are the subroutines and the individual movements which form the units of the subroutines. These two (subroutines and units) form the executive component of the model. The subroutines represent the various movement sequences comprising a particular skilled activity. These subroutines are seen as representing the commands forwarded from either the sequencer (non-habitual movements) or the programmer (habitual movements) which designate the ordering of the individual movements or units. The subroutines are thought to be somewhat independent of the goal selector and the sequencer but not of the programmer. They are not independent of the programmer since they are, in fact, part of the habitual motor program which the programmer directs. The programmer and associated subroutines are considered to be subserved by the premotor area (Allen & Tsukahara, 1974). On the other hand, the subroutines are considered autonomous from the goal selector and sequencer (at least the cognitive component) as these parts being subserved by prefrontal areas are thought to be involved in planning the appropriate sequences, not executing them. Damage to the premotor area results in executive apraxia (see Table 2) which is thought to involve a disturbance in executing the movement sequences represented by these subroutines.

At the lowest level of the hierarchy are the individual movements or units which comprise the movement sequences. Proper execution of these movements is thought to depend on intact pre- and postcentral primary motor areas. It is suggested that the integrity of these movements at this level may depend not only on the presence of relevant recurrent kinesthetic feedback (postcentral primary motor area), but also on copies of the efferent commands to the individual muscles concerned (precentral primary motor area). Damage to either of the pre- or postcentral primary motor areas results in unit apraxia (see Table 2) which is seen as a disturbance in executing these individual movements.

A final aspect of the model concerns the role of feedback. Feedback is thought to be operative in several ways at various levels. One form of feedback concerns the information about the consequences of executing a particular movement sequence. This information which is seen as similar to knowledge of results (Marteniuk, 1976a) is fed back to the goal selector and indicates whether the goal has been achieved. A second type of feedback provides information about the performance of the movement sequence itself. This information which is seen as similar to knowledge of performance (Marteniuk, 1976a) is fed back to the sequencer and indicates whether the individual movements were executed in the proper sequence and in the proper spatial framework. Both of these forms of feedback are considered vital in the process of planning and are thought to involve the frontal and parietal-occipital areas. There is much evidence to suggest that patients who have suffered frontal damage are unable to adequately use these forms of feedback so as to organize further activity (Luria, 1966; Luria et al., 1966; Teuber, 1964).

A third source of feedback is kinesthetic in nature. This feedback is thought to be involved in enabling the fine control of individual movement units within a sequence. Without this control movement takes on an ataxic-like quality.

While an evaluation of the worth of these speculations will require much more work to be done examining the disturbances in apraxia in more detail, even the cursory treatment provided here reinforces the need for models of motor skill that incorporate the features of hierarchical organization and sensory-motor integration. Moreover, the fact that highly practiced skills are often spared apraxic disturbance suggests further that models of human motor performance include the conception that over time some motor acts will become fully automated. The study of apraxia, however, not only has implications for model building, but also the investigation of the progress of apraxic patients during treatment may be able to tell us something about how to train skills in intact individuals. This latter aspect, of course, forms quite another line of enquiry, but one that should be pursued in the future (e.g., Heilman, Schwartz & Geschwind, 1975).

General discussion

The investigation of behavioral pathology is a necessary pursuit in that it not only provides clues as to the etiology of the pathology which, subsequently, may suggest a treatment regimen, but also it may facilitate an understanding of how intact behavior is organized. As the action in a moving film can be elucidated by playing it in slow motion, so motor behavior and the cognitive processes underlying it become more susceptible to analysis when observed in a pathological condition which reduces the rate at which information is processed. In the case of apraxia, this pursuit is particularly important since one of man's primary means of dealing with the environment, the skilled use of his arms and hands, is severely disturbed.

The purpose of developing this typology was to demonstrate that apraxia seems to represent, not a global, undifferentiated disorder of skilled motor activity, but rather a disturbance in a very complex functional system (c.f., Bernstein, 1967) which may have a number of discernibly different etiologies. An attempt has been made to try to understand the etiology of apraxia in terms of disturbance to basic component processes in this functional system. Apraxia has been characterized as involving either a disturbance in planning or executing a sequence of movements comprising a skilled motor act. Various perceptual, decision and effector aspects of these processes have been discussed with the aim of more clearly understanding this movement disorder. Moreover, this discussion has led to the development of a model for the organization of motor behavior which not only corroborates those developed from studies of skill acquisition but which also attempts to describe the cerebral organization of the various processes discussed.

Although an attempt was made to make the foregoing discussion cover a wide scope of data in some detail, there are some obvious omissions and shortcomings which must be considered. First, in this discussion little consideration has been given to cerebral laterality of motor function although some consideration has been given to this issue as it relates to apraxia (e.g., Hecaen, 1969; Kimura & Archibald, 1974; Liepmann, 1920). Some data presented by Liepmann (1920) and more recently by Kimura (Kimura, 1976; Kimura & Archibald, 1974) suggests that left hemisphere damage is particularly associated with disturbances in sequencing movements. Moreover, evidence from studies on intact persons both corroborates and extends these findings from pathology. Work by Kimura (Kimura, 1973; Kimura, Battison & Lubert, 1976; Lomas & Kimura, 1976), by Carmon (Carmon, 1971; Nachshon & Carmon, 1975), Roy (1976), and Wyke (1967, 1968, 1971) suggests that in right-handed adults the left cerebral hemisphere may be important for sequential motor activity, while the right is important for non-sequential, spatial localization judgements. While it is uncertain at this point how these laterality differences fit in with this typology of apraxia, it, nevertheless, is imperative that in attempting to empirically validate this classification scheme much careful consideration must be given to developing techniques which will help to identify disorders in both intra- and inter-hemispheric perceptual-motor functions.

A second consideration here concerns the term planning. While in this discussion planning is thought to have two components: a cognitive component attributable to frontal lobe function and a perceptual one provided by parietal-occipital function, it is, as yet, not completely clear how each of these components contributes to the sequential organization of the kinetic melody nor whether these are the only components involved. With reference to the frontal lobes Luria (Luria, 1966, 1973a, 1973b; Luria & Homskaya, 1964) has suggested that this anterior portion of the cerebral cortex may subserve some type of verbal control of human behavior. While this viewpoint has recently been questioned by Drewe (1975), it, nevertheless, remains that intact frontal lobes may provide for the cognitive aspects in planning movement in the form of verbal mediation. That verbal mediation may be important in the initial (planning?) phases of motor skill learning has been suggested by Adams (1971). Although the frontal lobes may enable the cognitive aspects in planning, the intimate connections between these areas and the limbic system in the diencephalon suggests that some emotive or motivational processes partially subserved by the frontal lobes may also be involved in planning.

Finally, one is unsure how the cognitive decision-making processes characterized here as a major function of the frontal lobes relate to the finding that frontal area may also be associated with egocentric spatial localization (Pohl, 1973; Semmes et al., 1963). If the frontal area does provide some type of internal spatial representation, a type of feedback mechanism may be built into its function. That is, following the decision to make (frontal area) and the execution of (premotor and motor areas) a limb movement, information as to the location of the limb with respect to the body may be fed back to the frontal association area to indicate whether the correct response had been made. Alternately, Teuber (Teuber, 1964, 1974) has suggested that the frontal area may function in a feedforward capacity involving the presetting of sensory receptors (e.g., muscle spindles and joint receptors) using some type of corollary discharge mechanism (see also Kelso & Stelmach, 1976). Considering the data mentioned above pertaining to laterality of motor function it may be that the left prefrontal area is more involved in the decisions concerning sequencing, while its right homologue may subserve the spatial feedforward function described by Teuber (1974).

Although at this point we are unable to forward a completely adequate definition of the term planning, we, nevertheless, recognize that a process similar to that described by Miller, Galanter and Pribram (1960) is probably involved. Moreover, we recognize that motor behavior may involve cognitive processes not unlike those ongoing in behavior which is to a large extent non-motor (e.g., problem solving behavior) and again raises the question posed by Geschwind (1965, pp. 625-626) as to how motor learning and cognitive learning differ.

Another point here concerns the curious absence of evidence implicating the temporal lobes in motor function. Although there is some evidence that temporal area damage may be concomittant with damage to the parietal-occipital areas (De Ajuriaguerra & Tissot, 1969), there appears to be no clear data which show apraxic disturbances following only temporal damage. Indeed, Corkin (1968) and others found that the famous case HM who had bilateral temporal-hippocampal excisions for the control of epilepsy showed little disturbances in motor learning in the face of severe verbal learning-memory losses.

These suggestions as to a typology of apraxia represent only a first step toward a more detailed and precise analysis of apraxia. Work must be done to cross-validate this proposal on patients other than those described here. Further more detailed analysis of the movement disorders must be attempted. These might include an analysis of more complex movement patterns than, for example, simply lighting a candle. Particular emphasis should be paid to alterations in direction, velocity and extent of movement. Recent work by Letts, Winter and Quanbury (1975) (1975) using electromyography and cinematography in the study of abnormal gait patterns suggests that these techniques might be put to use in the study of apraxia.

In summary, it is hoped that these suggestions will provide an impetus for more fruitful research in the area of apraxia. Through a more precise definition of the disorders underlying the various apraxic syndromes more adequate treatment for the apraxic can be developed, and, further, a more lucid model of the organization of motor skill may follow.

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Implications for rehabilitation of psychological research on spatial perception in the blind

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Psychological research on spatial perception in the blind falls into two general categories. Firstly, psychometric testing of which the most obvious example is IQ testing, and secondly psychophysical comparisons of blind and sighted persons. I shall say little here about the first category. The limitations of psychometric testing of handicapped groups are now reasonably well known. By large, blind children, as other handicapped groups, will fall below the mean of the non-handicapped on a number of psychometric tests including intelligence tests. Ordinarily we would wish to use such tests to predict the child's potential ability on the tough working assumption that children of the same age have had the same relevant experience. However, experiential opportunities for handicapped children are always limited to some degree, often severely, and predictions about potential will inevitably be inexact.

In the second category psychologists have compared the blind and the sighted in small scale experiments using a variety of psychophysical techniques developed in experiments with normally sighted persons (see Jones, 1975a, 1975b, for a review). Work here follows the tradition of Werner and Strauss in their studies of brain damage (and indeed blindness is a special case of brain damage). It is not in fact work which is primarily directed toward rehabilitation. In some cases psychologists have been more interested in the sighted than in the blind using the blind as a "control in nature" for the possession of visual abilities. Psychologists have asked, for example, whether visual imagery is necessary for spatial thinking (e.g., Millar, 1976; vonSenden, 1960) or for verbal learning (e.g., Paivio & Okovita, 1971) in the sighted. Again, the tradition of psychophysical has rarely emphasized individual differences yet it seems intuitively obvious that rehabilitation must begin from the particular abilities of the individual handicapped person.

In his discussion of echo location in the blind, Rice (1967) has noted that there are two plausible strategies. The first is to provide the blind with some echo signal which the experimenter expects will be useful. The second makes use of the signals the blind person may already possess:

> The first approach allows one to equate the signal variables for all subjects. The alternative method allows subjects to choose what they consider an effective signal but prevents the experimenter from determining whether differences in skill are due to differences in signal or to subject variables. (p. 657)

In short the aims of neat experimentation and of rehabilitation may not always be quite the same.

A related point is that psychophysical comparisons of blind and sighted subjects has tended to emphasize not "the particular abilities of the individual handicapped child" but rather the disabilities, the incapacities of the blind. A psychophysical experiment, like any other experiment is only as useful as the theory which underpins it and the most usual theories here are deficit theories. Of course no-one would claim that loss of vision is without consequence for perceptual development. Nevertheless the blind can achieve a high degree of ability in very many varied tasks. Emphasizing the handicapped child's deficits is often not very useful for rehabilitation. Instead we need to know just what it is he can do.

Visual dominance theories

Probably the most common theory of space perception is that spatial judgments are essentially visual judgments. Since this theory applied to the blind is by definition a deficit theory I shall start by providing a critique, a try to sketch an alternative position which can potentially aid rehabilitation.

The most extreme version of what I shall call the visual domain theory of space perception is that there can be no concept of spatial relations in the absence of vision. vonSenden (1960) in his monograph on restoration to sight argued that all real knowledge of space is gained through sight so that the person restored to sight is unable immediately to perceive visual form and depth without further visual experience. This account is very difficult to follow on purely conceptual ground. Kant, you will remember, argued the concept of space is logically prior to any judgments about particular spatial relations. We can judge an object to be above, to the right of, behind another and soon but we do not acquire the concept of space from these separate judgments for what else are they but spatial judgments. Put it another way, I could be wrong if I were to say that some parts of the Pacific are to the east of Quebec City. Only observation could disconform my statement but no empirical evidence could conceivably refute the porposition that Quebec City and the Pacific stand in some spatial relation. Kant did not mean to say that the concept of space is innate, whatever that means. The concept of space may be an inevitable organizing principle or "category" for all mankind but we should not confuse logical priority with temporal priority in development.

A much more sophisticated visual dominance theory is that spatial co-ordinates are primarily visual so that non-visual signals are located in terms of a "visual map" (e.g., Warren, 1970).

This account too has its conceptual difficulties. It is hard to say whether or not the visual map is some logical requirement for, say, auditory localization or whether it is a temporal prerequisite. Warren (1970) assumes that the visual map is both logically and temporally prior to spatial judgments in other modalities (i.e., visual spatial co-ordinates are given at birth or acquired fairly quickly afterwards). Since he found that school-children could more accurately point to the source of a sound in the light than in the dark, he argued that lengthy experience is required for the co-ordination of visual and auditory space. The argument places children in the peculiar position of having to assume that the visible signs of an object are not associated with its auditory signs, that a car for example is in fact two objects, one which can be seen and one which can be heard. In practice Warren's data may be confounded. I found that school-children could more accurately report the position of a tone in the light than in the dark (Jones, 1975a, 1975b) and I suggested that this effect may have been over-ridden by inaccurate pointing responses in Warren's earlier study.

Again in practice, newborn infants may be able to detect auditory visual discrepancies (Aronson & Rosenbloom, 1971), so that a common auditory-visual space is simply a human given.

Warren (Warren, 1970; Warren & Pick, 1970) argues that the nature of the interdependence of the sensory modalities changes with age in a regular manner. However, I found that the localization of a cutaneous point with eyes open was consistently more accurate in children between 5 and 12 years than localization with eyes closed (tactile method) and that there was no significant developmental increase in "visual" accuracy. The "tactile" method showed some improvement with age but was still not equal to the "visual" method by age 12 (Jones, 1972). Consequently, there is evidence against the notion, upon which Warren (1970) in some measure relies, that vision becomes a more important modality with age and in part against any theory that one modality may be dominant at a particular development stage.

More direct evidence against the theory that space is organized in visual terms comes from the work of Hermelin and O'Connor (1971) who found that blind children and blindfolded children and adults tend to pair an associate word with the finger touched rather than original spatial location when learning was tested with the hand reversed. With vision, however, both children and adults responded primarily in terms of visual location. Therefore spatial location cannot be organized in purely visual terms, though the work of Hermelin and O'Connor (1971) is not sufficient to show that space is independently structures by each modality. They have demonstrated only that blind and sighted persons may not always make the same spatial judgments given the same information in the same modality. This is not to show that the two groups cannot make the same judgments, that space is differently structured in the two groups.

An alternative to visual dominance

Much of the interest of blindness for psychologists stems from a new conception of perception which emphasizes relationships between sensory systems (e.g., Freedman, 1968). Spatial judgments may depend upon some fusion of intersensory information with vision as one aspect of a mutually integrated system rather than as the primary spatial map.

I have argued (Jones, 1975a, 1975b) that the integrating factor in intersensory cooperation is not any afferent information but rather patterns of efferent outflow, patterns of voluntary activity. Spatial relations are understood through the organization of actions performed on objects in space. In other words our ability to make spatial judgments results from voluntary manipulation and control of the spatial environment rather than immediately given sensory impressions. What I am saying is of course familiar as Piaget's account of perceptual and cognitive development. Perception is a family of skills developed in relation to the voluntary action patterns, the motor skills by means of which we act upon the environment. Of course vision will provide the infant with considerably more opportunity to develop independent voluntary action. The blind baby cannot reach for objects with only visible aspects unless he contacts them tactually which is to say more or less hazardly. Until sound at a distance can provide a cue for ear-hand coordination the blind baby will remain immobile and since this coordination does not occur until well into the first year (for both blind and sighted children) the blind baby is much slower to develop self-initiated independent mobility.

More specifically particular movement patterns may be involved in particular spatial judgments. Together with my colleagues I have proposed that maximum accuracy of auditory localization depends upon target directed eye movements (Jones & Hesketh, 1977; Jones & Kabanoff, 1975). Eye movement toward an auditory target probably serves to stabilize auditory position memory. We have shown localization is less accurate when the eye maintains a constant fixation and further that we tend to report auditory position according to eye position. Table I contains the necessary data. I shall return to this data later because it allows us to make some suggestions for rehabilitation.

At this point I shall review a number of experiments on spatial perception in the blind to show where the main problems for rehabilitation may lie. I should stress that no simple summary can do justice to the evidence if only because the evidence is profoundly equivocal.

Much of it has been gathered with a "deficit" theory in mind and investigators as we know generally obtain the result they expect. We have been too easily content with demonstrating poorer performance by the blind using one isolated method and we have rarely asked is there some method which would show the blind and sighted to be equivalent or perhaps even show the blind to be superior?

We should also notice that we can exercise the concept of space at many different levels. Consider such tasks as the ability to localize a sound, to imagine an orientation rotated, to execute a movement pattern in the correct spatial and temporal sequence, to understand unfamiliar terrain from reading a map, to give a description of spatial relationships. Indeed these tasks all correctly described as spatial, are so varied that I hesitate to use the word level. There is no obvious conceptual hierarchy here. Indeed "spatial perception" refers to a family of abilities which may be quite independent. We are all familiar with the highly skilled person who is unable to give any very useful verbal description of what he does. Or, more murdanely, we can reach home without difficulty yet we might find it difficult to give directions to someone else. If blind children have difficulty recalling a haptically presented orientation particularly in its mentally rotated form (Millar, 1976), they may have little difficulty in voluntarily retracing a complex path (Juurmaa & Suoni, 1975) or in following a map from memory (Leonard & Neuman, 1967). Similarly, though blind children have more difficulty than the sighted in solving spatial problems of the form used by Hartlage (1969):

> "John is in front of Mary - Mary is in front of Bill - Bill
> is in front of John_____ - Bill is in back of John_____ -
> Can't say."

Their relative inability (note not total inability: Hartlage concluded that his results showed the "crucial" native of vision for spatial comprehension) may reflect only a particular problem with the abstract representation of spatial terms rather than any general spatial orientation problem.

Hearing

Hearing is the only modality which would allow the blind to anticipate objects beyond the immediate reach of their own bodies or of some extension of their body (the familiar cane). Hearing will generally provide only intermittent data so much so that Leonard (Leonard & Neuman, 1967) once described mobility for the blind as equivalent to a vigilance task for the sighted. The blind traveller can anticipate very little and must be constantly alert for danger signals. He is often forced to deal with events after they have taken place instead of being adequately prepared for their occurrence.

Hearing is obviously crucial to object detection and the work of Rice and his colleagues (summarized by Rice, 1967) shows that at least some blind persons may make very skillful use of echo ranging signals to locate and position objects in the environment. Rice's work seems to me especially important because it is a paradigm case of psychophysical research which demonstrates the individual abilities of the blind, precisely the sort of research which can provide useful guides to rehabilitation. Rice and his colleagues initially allowed blind subjects to choose whatever auditory signal they found most useful. In practice their signals were of two basic types, an elongated hissing sound or a click made with the tongue. Both sounds covered a wide frequency band (the hiss was essentially similar to white noise). Interestingly the hissing sound was produced for as long as 5 seconds allowing the sound and the echo cues to overlap. In other words with an appropriate signal the blind person can compensate for the normally transitory native of auditory cues.

Using such cues Rice showed subjects can detect targets at distances up to about 9 feet, with ease of detection being roughly proportional to target diameter. Moreover, subjects can discriminate between targets in size so that echo ranging can and does provide minimal cues for form discrimination.

As well as merely detecting objects it is important that the blind person fix the location of echo cues. Rice's work also shows that sightless persons can use echo signals to detect the position of objects as much as 90^0 to the right or left of their body even though their signal is directed forward at 0^0. Interestingly they only very rarely report the presence of a target when the target is in fact absent. It is obviously crucial that the blind person can on occasion notice the absence of expected information.

Rice's demonstrations were made with subjects who were independently mobile. However, perhaps less than 15% of blind persons according to Rutberg (1976) are independently mobile using the very minimal criterion of travelling more than one block from their home unaided. Since the techniques used by Rice can apparently be acquired in a very few hours it would not be a major project to teach echo ranging skills to the non-mobile blind population.

The independently mobile blind person may be in fact a person who has spontaneously developed similar skills. Curtis and Winner (1969) suggested that changes in intensity rather than frequency are more likely to provide the blind person with useful echo cues since human being work within a far lower frequency range than, say, bats or porpoises. They found that expert blind travellers made significantly fewer errors than either home-bound or sighted subjects in detection of changes in intensity while there was little difference between the three groups in detection of an increment in frequency.

Accuracy of relative localization of sounds appears to be similar in both blind and sighted. Gomulicki (1961) found that blind and sighted children between 5 and 15 years either indoors or out of doors were equivalent in judgments of whether alternate sounds came from the same or different positions. However, when the same subjects were required to establish the absolute position of a sound by swirling in a chair in its direction the blind were considerably inferior to the sighted. Gomulicki (1961) found that out of doors (the less complex situation acoustically) the blind required the age range 5-15 years to reach the sighted level of accuracy. Indoors, blind subjects were still inferior to the sighted at age 12 and showed no improvement beyond the 12-year level. From many points of view Gomulicki's study is extremely informative. It controlled for age, intelligence, extent and duration of visual impairment for example. However, the study does confound two possibly independent abilities and illustrates the need for using several methods in research with handicapped children. The abilities are firstly discrimination of the tone's position and secondly orienting with respect to that position (I made the point previously that sighted children may be able to report the position of a tone verbally but in the dark at least, may be quite poor at pointing to that position). Spreigelman (1968) using a different method of indicating auditory position, a method which is less confounded with motor control, found that early- and late-blind subjects could in fact localize sounds more accurately than blind-folded sighted subjects. Spreigelman's blind subjects were all familiar with the Braille watch and he used a clock-face response panel so that subject's could indicate the source tones presented at with either head free or head restrained clock-face positions around them. Results are shown in Table 2. Notice that the effect of restraining the head is rather more marked for the two blind groups. Almost certainly as Table 3 shows, head movements allow the blind subject to limit the number of reversals, i.e., failures to discriminate front and back positions when phase and intensity differences at the two ears would be equivalent. Clearly Spreigelman had demonstrated either the equivalence of blind and sighted or the clear superiority of a blind group. Notice too that his experimental method requires the blind person to have no difficulty transferring tactually acquired spatial knowledge (the watch face) to an auditory space. The successful outcome of the experiment is in itself evidence against the frequently asserted proposition that sensory systems in the absence of vision must inevitably remain unintegrated (e.g., Gomulicki, 1961; Warren & Pick, 1970).

Let us, however, assume for that the blind have poor auditory localization skills. Do the studies we have discussed suggest any rehabilitation techniques?

The data in Table 1 show that eye movements are necessary for really accurate auditory localization and we also know that accuracy of sound localization in the dark is not as accurate as in the explanation for this phenomenon which I have sketched (Jones, 1975a, 1975b; Jones & Hesketh, 1977; Jones & Kabanoff, 1975) depends upon the fact that

Table 1

Mean values of P(A), for auditory localization [P(A) is estimate of discrimination accuracy] for sighted subjects when time position of the eyes is fixed, free to vary, or opposed to the position of the tone

Free	Fixed	Opposed
.91	.69	.24

Table 2*

Mean number of correct localizations (N — 72)

	Head free	Head restrained
Early-blind	29.17	24.06
Late-blind	39.56	33.78
Sighted	28.06	25.56

Table 3*

Mean number of reversals

	Head free	Head restrained
Early-blind	4.72	7.22
Late-blind	4.28	6.61
Sighted	5.44	6.22

*From Spreigelman (1968).

involuntary eye drift goes largely unnoticed in the dark. The eyes may in fact drift up to 5^{0}-10^{0} before we realize the need for correction (Becker & Klein, 1973). Ordinarily a visual background allows us to correct for eye drift and target directed eye movements can then be more efficiently used to fix the position of transient tones.

The blind person attempting to localize a sound from a fixed position may be compared to the sighted person in the dark. Control of eye movements is likely to be poor, since the blind person has little information with which to correct involuntary drift (in a number of cases the eyes may even have been enucleated), and a convenient means of confirming auditory position is unavailable. Accurate control of eye movement has ordinarily been thought to serve little purpose in the blind, yet it may be possible to facilitate auditory localization in many blind persons by using a verbal, cueing technique for eye movement. We found that instructing sighted subjects to turn their eyes in the appropriate direction facilitated localization of tones in the absence of any visual data (Jones & Kabanoff, 1975). We are well aware that ocular muscular atrophy may make accurate eye control an impossibility for very many blind persons. This technique could, however, be commenced with young children and even where such atrophy has taken place similar techniques may be substituted. For example it does appear from Spreigelman's data (Tables 2 and 3) that blind persons make more use of spontaneous head movements than the sighted in order to determine front and back positions.

Haptics

If hearing gives the blind person knowledge of the world beyond his immediate, tactual perception can to some extent take the place of vision within the person's body space. For example the late Alfred Leonard showed that tactual maps can provide the blind with a considerable amount of information about a new area (Leonard & Neuman, 1967). Following training with the maps blind boys were able to orient themselves with little difficulty and could solve a detour problem. The implications for rehabilitation are obvious. The blind may fail to orient themselves adequately not because they cannot grasp complex spatial relationships but simply because they lack the relevant specific experience. In many cases the sighted person without fore-knowledge can orient himself adequately by reference to visually perceived landmarks and hence can anticipate obstacles. Lacking sight immediate anticipation is clearly difficult for the blind and the tactual map provides a prior schema which allows considerable prediction of the terrain.

Leonard was one of the few psychologists whose experimental work was directly in the service of rehabilitation. He argued strongly that the most effective experimental analyses of blindness can only be performed in direct conjunction with training programs, that practical and theoretical purposes can be efficiently combined.

It is also my belief that a good deal of experimental work could only gain by being combined directly with training and education. I am not saying that all rehabilitation programs are necessarily all they should be. I have myself questioned the value of physiotherapy programs for cerebral palsied children (Jones, 1974) and one obvious use for experimental techniques is precisely in the evaluation of training programs. The separation of experiment and practice may be harmful to both and at the least will make it difficult to draw therapeutic implications from experiment.

For example, the full implications of Davidson's very valuable work on exploratory movements in blind and sighted persons (e.g., Davidson, 1972) seem to me difficult to discern because the work is not closely integrated with rehabilitation. Briefly, Davidson and his colleagues videotaped the hand and finger movements of subjects exploring a curved edge. They were able to show that in general the blind used more efficient haptic strategies, making significantly more use of all four fingers and tending to explore the front edge of the object rather more often. Yet we do not know how these strategies were acquired. Had they been directly taught to the blind or were they spontaneously acquired presumably with a great deal of trial and error? In the latter case there is good ground for formalizing Davidson's findings as part of a curriculum for the blind but if such movement patterns are already taught to the blind we have learned little that is new for rehabilitation purposes. I do not want to end this brief description of Davidson's work on a critical note. All in all it is an excellent example of research which aims to uncover the special abilities of the blind and it is therefore just the kind of research on which rehabilitation techniques can be built.

Conclusions

We can see clearly much of value for rehabilitation from well controlled psychophysical experimenters. However, I have tried to suggest here that a good deal of research is not directly concerned with rehabilitation. The most useful research will show not the deficits but the special capacities of the blind. Hopefully we will not merely emphasize the failings of the blind. After all, it is probably not too difficult to show that the blind do not do so well as the sighted if we insist that only one particular method is appropriate. Also deficits in an experimental situation may not matter very much in practice. It is too easy to assume that statistically significant differences between blind and sighted persons are in fact significant. If on a spatial test grade 12 blind children answer 10½ questions out of 16 correctly compared to 11½ out of 16 by the sighted (Hartlage, 1969) the result may be statistically significant but hardly supports the proposition that "relational judgment may be specific to experience with the specific (visual) domain (Hartlage, 1969, p. 182)." Nor does the result suggest that we may need to employ special rehabilitation techniques to teach blind children spatial concepts. Similarly if as I have suggested from Gomulicki's (1961) result that the blind can orient less well than the sighted with respect to the perceived position of a tone, the difference is only one of inches over a radial distance of 12 feet. Again the result does not necessarily imply that we need special rehabilitation procedures.

The value of research like that of Rice (1976), Spreigelman (1968), Leonard and Neuman (1967) or Davidson (1972) is enormous if only because it contradicts prevalent myths about the spatial deficits of the blind.

An optimistic climate is probably as important for successful rehabilitation as the invention of useful training methods.

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Intersecting links: The brain, vestibular mechanisms, and learning

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Research findings indicate that a large majority of individuals with perceptual deficits affecting learning have difficulty with posture, balance, gross, and fine motor co-ordination. Often noted as well will be angst, emotional lability, impulsivity, and distractability. Of course each individual will demonstrate variability of these factors along a continuum.

In addition, recent research by Dr. Jerre Levy from the University of Pennsylvania and Dr. S. Witelson at McMaster University in Ontario finds different patterns of cerebral lateralization effecting cognitive organization. More variables are being documented.

What is the intersecting link? Documented studies of the vestibular system provide an intersecting link between perceptual deficits, learning, balance, emotional lability, disinhibition, and cortical lateralization.

The vestibular system influences motor processes at the brain stem such as posture and locomotion. It influences neck muscles and joints; and eye movements as we see in post rotational nystagmus. The vestibular system plays a sensory integrative role between proprioception, intersensory associations and cortical projections. It influences inhibition as well as arousal. The vestibular system is involved in emotional processes too (Ayres, 1972).

The vestibular system is one of many neural structures which contribute reciprocal influence providing a balancing functional relationship for homeostasis. These neural structures will be synergetic as well. The vestibular and proprioceptive systems contribute constant reciprocal influence in this way.

Normally the proprioceptor nerve endings, stimulated by muscular activity will leave impressions of changes in body position during movement. These impressions lead to mental enhancement and refinement of that body position, if repeated, so that its normal position remains undisturbed. In this way kinesthetic awareness and balance result.

However, for some individuals this vestibular-proprioceptive integration for kinesthetic awareness and balance does not occur. Instead we see a vestibular-proprioceptive dysfunction. As early as 1925, Prechtl described a syndrome of vestibular-proprioceptive disorganization leading to a language delay. Later, in 1972 Payne noted many learning disorders resulting from disassociation of the proprioceptive and vestibular systems. That same year Brodal published research on basic aspects of central vestibular mechanisms in a series of Progress in Brain Research. During this time, at the University of Southern California, Dr. A. J. Ayres completed and published a study of sensory integration and learning disorders involving vestibular-proprioceptive dysfunction.

In Argentina, Dr. Julio B. de Quiros completed a longitudinal experiment on posture, equilibrium, and learning. This study was conducted over a 7 year period with a total number of 1,092 children. In this study, Dr. de Quiros verified consistent learning disabilities related to postural disturbances. These students with learning disabilities showed a concomitant disorder of vestibular-proprioceptive integration. In 1966, in Lima, Peru, J. B. de Quiros presented before the American Congress of Psychologists his study: "Vestibular-proprioceptive Integration: Its influence in learning and speech in children".

In the United States another study in this field is currently published by Dr. Frand and Dr. Levinson in collaboration. They examined over 1,000 children usually diagnosed as having specific, primary, or developmental dyslexia. Their investigation of these children revealed an underlying vestibular-proprioceptive dysfunction.

These cases of vestibular-proprioceptive dysfunction were tested. They reveal: positive Romberg, difficulty in tandem walking on a changing consistancy board, dysdiadochokinesis, hypotonia, and lack of bilateral postural integration. There is tilting or rotation on the Goodenough-Harris Drawing test and the Bender Gestalt revealing disturbances of spatial orientation.

In testing we find that individuals with vestibular dysfunction increase reliance on proprioception. The vestibular deficit may have resulted from chronic ear infections. It may be the result of emotional trauma or a biochemical disturbance. Dr. Levinson has noted vestibular dysfunction from increase and consistent dosages of antibiotics as well. The greater the vestibular dysfunction, the greater the reliance on proprioceptive input. As the vestibular deficit continues, the individual does not have an internal gravity-equilibrium system for adapting to changing surfaces and orientation. The individual must structure orientation in space and time from external stimuli. The individual seeks to keep everything the same. The furniture must be in its exact location. The school day routine must be the same. Changes in this routine become very upsetting, even causing catastrophic reactions. Such a person may wander aimlessly about as an astronaut in space. Some individuals weight themselves down as did one student with canteens of water on an army belt. Others may sit wedged between a chair and table to increase stability.

Post rotorary nystagmus will be prolonged in many cases. This vestibular reaction visible in the extra-occular muscles will make the printed page look like the following illustration of print in motion. Is it any wonder, then, that the individual avoids reading? Often this same individual avoids many movement patterns too. One becomes too dizzy and loses orientation in space as well as having inadequate postural reactions for balance in the beginning.

The individual we have described will continually increase reliance on the proprioceptive system. Muscles will be tensed and joints flexed in an attempt to compensate for vestibular deficit. Thus reciprocal and synergetic value of the two integrated systems is lost. In addition, emotional overlay may become apparent. As the muscles are constantly held in tension, angst is produced. The individual may seek momentary release of angst by kicking, hitting, or throwing objects. Thus, one encounters behavioral problems.

The vestibular system is closely associated with the limbic system. Emotional response occurs with vestibular dysfunction. We see emotional lability; crying one moment, laughing the next, or inappropriate emotional responses as in "perseveration". The emotional response from one situation will be used in another context where it is an inappropriate response. The individual is locked into a task or response and repeats it over and over without adaption.

Another emotional reaction displayed frequently is termed: "tactile defensiveness". This reaction is caused by a lack of integration of the somatic system. The individual is overly sensitive to touch. The primitive tactile system, which relays through the reticular formation, signals pain and light touch. This non-specific system will not be integrated with the more complex system of discrete touch. The person feels light touch as painful stimuli. This primitive tactile system carries the signal for the "flee or fight" response. The individual resists touching, fights or runs from the situation. Many students with this tactile deficit wear protective armor; a heavy jacket or hat is worn all the time indoor in order to insolate against tactile defensive reactions. Activities for remediation of tactile defensiveness will be illustrated in the slides to follow.

In other individuals the vestibular-proprioceptive syndrome is manifest through proprioceptive deficit essentially. Sometimes hypoxia occurred. Oxygen deficit to Betz cells in the pyramidal tract may have happened. Convulsions in infancy are a common history in this deficit. Whatever the origin, the result is inaccurate response from the proprioceptive (muscle, skin, joint) response. Again tension of muscles and pressure of joints will be increased abnormally in an attempt to receive kinesthetic input. The student may press a pencil very hard against the paper when writing for example. In fact, the student is at the pencil sharpener more often than at his desk during a writing assignment. This increased pressure breaks the pencil lead. Half way through a notebook, one can see the indent of pressure from the top page. This student writes with a "wooden arm" and complains of hand cramps. The student does not receive accurate input about where the hand is moving on the page.

Since there is a proprioceptive deficit in this case, the individual will seek to increase vestibular input as compensation. Swinging, spinning, jumping and sliding will be elicited at every opportunity.

Frequently, there will be no post rotorary nystagmus. The individual does not yet dizzy; this individual can enjoy all the rides in an amusement park, one after another in rapid succession. Vestibular input is not being mediated.

Disinhibition will be noticed in such an individual. One acts without foreseeing the consequences. One is impulsive and distractable. The individual will be drawn to irrelevant stimuli when attempting to concentrate. This lack of inhibition is caused by vestibular deficit, in part. Vestibular input has a highly facilitory effect on inhibition.

The individual may develop poor mental image of his body. The "Draw a Man" test is evidence of this lack of body schema. Let me show an illustration. This lack of accurate proprioceptive input affects the kinesthetic image. Le Boulch has stated that the child must achieve this kinesthetic image or interior schema and match it to the visual image before the Piaget stage of "decentering" occurs. Because this "decentering" phase is thus delayed, the child is termed immature.

Proprioceptive deficit leads to apraxia, or motor planning difficulty. The interior body schema is not apparent. The ability to sequence two motor tasks is impeded. Without internal schema, the individual must use cognitive thought processing for otherwise automatic motor planning. Such an individual has difficulty with academic tasks demanding sequencing such as math and spelling. Elaborate compensating patterns are sometimes developed, instead.

Through imagery, we may experience a momentary example of vestibular-proprioceptive disassociation. Take a Carribean cruise. The ship rolls and pitches through the waves. One's equilibrium is constantly shifting. The vestibular system will play a dominant role in adaptive response to this motion. But when we arrive at port and disembark, the proprioceptive system becomes the dominant stabilizer once again. For a moment or so the reciprocal and synergetic influence may be missing. We step falteringly, somewhat insecurely on the dock. For a moment we may expect the ground to come up and meet our feet. This disparity is fleeting, however.

Imagine, now, living with that equilibrium postural dysfunction much of the time. If the environment seems to change inconsistently as in vestibular-proprioceptive dysfunction, is it any surprise the individual lacks perceptual constancy? Wouldn't space visualization tasks seem difficult?

The next question is not so easily answered. Do individuals with perceptual deficits that involve learning disabilities have a different cortical organization for language and spatial functions? Normally right handed individuals have the left hemisphere of the brain lateralized for language function; the right hemisphere specialized in spatial functions. This has been established by EEG alpha asymmetry and dichotic listening tests at Langley Porter in San Francisco and at other brain research centers. EEG studies, as the Angie Nall Hospital studies reported in Academic Therapy, 1973, show that individuals with learning disabilities produce little or no alpha wave. Recently Dr. Sandra Witelson published a study on hemisphere specialization in developmental dyslexia. In this study of 85 dyslexic boys it was found language functions were lateralized in the left hemisphere. What was different was form and space perception. The dyslexic subjects were found to have bi-lateral hemisphere representation for spatial function. In this study it is suggested that as a consequence, dyslexics may use spatial processing whenever possible and this may be one of their problems in reading.

Studies demonstrate that there are great individual differences in the degree and direction of hemispheric asymmetry. Some individuals have very laterally differentiated hemispheres, while others have less differentiated hemispheric function. The implication for educational strategies is clear. We must offer different cognitive styles as suggested by Robert Samples in his book titled The Metaphoric Mind. Educational emphasis has been on the functions of the language hemisphere. This is the dawning of equally important forms of learning involving right hemispheric functions of art, dance, music, rhythm, drama. Only movement has been educating both hemispheres.

You, by your presence at this symposium, know the most significant integrating influence of all these factors in the brain and the body--

MOVEMENT. It expresses life, joy, self-discovery, freedom, communication, and acceptance. Strategies for remediation of perceptual deficits must include movement.

On this basis, I began a psycho-motor program for students with vestibular-proprioceptive dysfunction that involved water activities in a pool as well as activities in a gymnasium. These activities are set in juxtaposition. The water provides uneven, soft changing surfaces for differentiated adaption; the gymnasium provides contrasting hard surfaces. The intent of the juxtaposition is to facilitate integration of vestibular-proprioceptive reciprocity.

Such a program offers differentiated sense qualities in four dimensional space, compared to the more limiting movement possibilities on the ground. The movement ability in the water is free and unlimited. Resistance from water is differentiated from resistance of solid surfaces. The contrast of repetitive activities in the water and then on the ground offers postural learning through insight. Each muscle group may have many different exercises, utilizing different body angles or positions to increase the convergence of sensory input throughout the total range of motion.

The measurement tools included: Beery (eye hand co-ordination); Goodenough (body image); Wold (handwriting skill); Jordan (reading reversals); Developmental levels - trunk strength and ocular-motor efficiency; Romberg test on changing consistency board.

On slides let me illustrate some of the activities: Jumping waves on a large parachute; log roll between tumbling mats; barrel stroke in swimming; spinning in flexed supine position in a roll-a-sphere; spinning in an inner tube on the surface of the water; motor planning movement of the body through a spinning hula hoop; torpedo - a movement with feet leading in back float through hoops; balance boards; balance on waterbed mattress filled with air and floating on water; scooter board soccer; hammock activities; slide into water and swimming underwater obstacle courses.

Results of the first year are show on the next table. This is the beginning of a continuing project.

Table 1

At the completion of each year of participation in the Learning Lab Program, the student will demonstrate competence or significant positive improvement in automatic psycho-motor functions (balance, posture, large and small muscle coordination, spatial awareness).

Measurement tools: Beery (eye-hand coordination); Goodenough (body image); Wold (handwriting skill); Jordan (reading reversals); Developmental levels - trunk strength and ocular-motor efficiency

Criteria: Age appropriate score 26

Results:

	Range	Mean	# Tested
Fall	6 to 19	13	17
Spring	9 to 26	19	54

Average gain 6

	Regression	No Growth	Up to 1 yr	1-2 yrs	2-3 yrs	over 3 yrs
Beery	6	2 + *2	12	7	3	2
Goodenough	7	6 + *9	9	10	2	1
Wold	1	8 + *1	22	12	3	1
Jordan	5	5 + *9	8	11	3	3

Improvement on a 5 point scale

	0	1	2	3	4	5
Ocular-motor efficiency	5 + *2	3	7	1		
Trunk strength	1 + *1	6	8			

*Age appropriate level attained in pre-testing.

Since disorganization of the vestibular-proprioceptive system underlies many learning difficulties and can be diagnosed, and since the program I illustrated shows improved scores by students in the program, it is my hope others will initiate similar programs, for the integrated joy of movement.

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Note: Slides and photos are available at the author's address:
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ANNEXE I

CONFERENCE DE MONSIEUR CLAUDE CHARRON, MINISTRE DELEGUE AU HAUT-COMMISSARIAT A LA JEUNESSE, AUX LOISIRS ET AUX SPORTS, GOUVERNEMENT DU QUEBEC

Conférence de monsieur Claude Charron
Ministre délégué
Haut-Commissariat à la Jeunesse, aux Loisirs et aux Sports
Gouvernement du Québec

Mes chers amis,

Je suis très heureux d'être parmi vous ce soir. Ma présence vise à souligner de façon particulière l'intérêt primordial que porte le nouveau gouvernement du Québec à l'insertion complète et régulière des gens souffrant de handicaps dans l'ensemble de la société québécoise. Les personnes handicapées sont pour nous des citoyens à part entière avec les mêmes droits et les mêmes privilèges que les autres citoyens. La population en général doit les reconnaître comme faisant partie intégralement du corps social québécois et il est de notre devoir, en tant que gouvernement québécois, de travailler sans relâche à la réalisation de cet objectif.

"Une société s'évalue à la façon dont elle traite ses minorités" dit souvent le Premier Ministre du Québec. Et bien, je crois que cette phrase prend toute sa signification dans le contexte qui nous préoccupe tous, ici ce soir. Une société sera véritablement qualifiée d'humaine lorsque tous les citoyens, quelles que soient leurs particularités, pourront vivre en harmonie les uns avec les autres dans un climat de justice, d'égalité et de tolérance.

Cette nouvelle société québécoise que veut susciter le gouvernement élu le 15 novembre dernier doit favoriser cette intégration sociale. Nous devons y travailler avec fermeté et, je le dis bien consciemment, sans cette fausse pitié qui a trop souvent accompagné les interventions gouvernementales dans ce domaine en particulier. Nous devons y travailler avec comme seul souci derrière la tête la justice et l'égalité pour toutes les catégories de citoyens.

Le Ministre des Affaires Sociales Denis Lazure, présentera tout de suite après Pâques à l'Assemblée Nationale du Québec, un projet de loi sur les droits de la personne handicapée. Après le dépôt de cette loi, une consultation assez élargie sera entreprise auprès des groupes intéressés à cette question.

De son côté, le Haut-Commissariat a commencé à se préoccuper sérieusement de ce dossier en 1969. Cette préoccupation, je peux dire qu'elle se divise en quatre étapes. D'abord identifier les objectifs que le Haut-Commissariat voulait atteindre en travaillant sur cette question importante. Deux objectifs principaux ont été retenus à l'époque et sont encore à notre avis des objectifs forts justes et pertinents: premièrement, la normalisation des activités de loisirs pour handicapés et deuxièmement, l'intégration sociale de l'handicapé par le biais du loisir.

Après l'identification des objectifs, il fallait absolument mettre en place des structures qui veilleraient à la réalisation concrète de ces objectifs en étroite et constante collaboration avec les intervenants du milieu. Sur ce point des structures, la situation a nettement progressée depuis 1969 et je crois que le Haut-Commissariat a participé activement à cette phase importante d'implantation. Ses subventions aux organismes du milieu sont passées de $50,000.00 en 1969, à près de $500,000.00 cette année. Nous pouvons dire, sans trop nous tromper, que sur ce point les choses vont très bien.

Nous reconnaissons officiellement comme interlocuteurs privilégiés entre le Haut-Commissariat et les personnes handicapées, la Fédération des Loisirs et des Sports pour Handicapés du Québec et les associations régionales pour handicapés. Sur le plan des structures et des organismes du milieu, la phase d'implantation tire à sa fin.

La troisième étape importante déjà amorcée par le Haut-Commissariat, c'est la phase de consolidation des programmes de loisirs et de sports pour les personnes handicapées. Une action est déjà amorcée et elle s'amplifiera au cours des prochains mois. Une réflexion fondamentale s'intensifiera au Haut-Commissariat dans un avenir rapproché. Il y aura sûrement des passages importants sur toute cette question dans le Livre Vert que je soumettrai pour discussion publique aux intervenants du milieu et à la population en général au cours de l'été qui vient.

La quatrième étape qui est, à mon avis, la plus cruciale et la plus significative, c'est celle de proposer une politique globale et fondamentale, à l'échelle du Québec, de reconnaissance des droits des personnes handicapées et là, vous le voyez bien, je déborde amplement le cadre de l'activité physique en soi et même du droit au loisir comme tel.

La phase cruciale, c'est la phase de concertation absolument vitale au point où nous en sommes rendus, entre tous les agents qui oeuvrent dans -ou interviennent auprès- des personnes handicapées. Sans cette concertation en vue d'une politique globale et intégrée pour l'ensemble de notre société, chaque intervenant voit son champ d'action extrêmement limité. Rendus ou nous en sommes rendus, toute action isolée est vouée à l'échec partiel ou total.

Car c'est bien beau d'énoncer des grands principes, les gouvernements sont habituellement très forts là-dessus, mais il faut que la réalité soit conforme à ces objectifs où, à tout le moins, il faut qu'on sente que la réalité tend à être conforme ou s'approche progressivement des objectifs. Je ne voudrais pas que mes propos demeurent des slogans creux et vides de sens: en acceptant la présidence d'honneur de ce symposium international sur l'activité physique adaptée, j'avais un but précis en tête; essayer de rendre conscients, l'ensemble des intervenants, de l'urgence de cette concertation afin d'en arriver à une politique globale, pour en finir le plus rapidement possible avec les mesures improvisées, sectorielles, les politiques de bouts de chemins comme on les appelle au Québec.

Je vais vous donner un exemple précis qui illustrera de façon simple et sans équivoque ce besoin impérieux de concertation. Dans le secteur de ma responsabilité ministérielle soit les sports et les loisirs, assurer les droits des personnes handicapées ça veut dire entre autres:

Premièrement, le droit de l'handicapé à la pratique de l'activité physique, deuxièmement le droit à un encadrement spécialisé et adapté aux besoins de ces citoyens et finalement le droit à l'accessibilité aux installations existantes.

Même pour assurer ces trois droits, directement reliés à mes fonctions, il me faut dans notre société moderne, complexe et hiérarchisée, la collaboration étroite et soutenue d'une foule d'intervenants à tous les niveaux de l'organisation sociale.

Réduisons encore l'exemple pour une meilleure compréhension. Si je veux assurer aux personnes handicapées physiquement l'accessibilité aux installations sportives existantes, il nous faut, entre autres, éliminer toutes les barrières architecturales. Automatiquement, si je veux réussir, il faut que j'embarque dans le coup, les gouvernements municipaux, les commissions scolaires, les autres ministères du gouvernement et l'entreprise privée. Sur ce seul point, il faut que tous ces paliers d'interventions agissent dans le même sens.

Qu'il s'agisse de leur vie au travail ou qu'il s'agisse de leur vie de loisir, les personnes handicapées doivent être intégrées à la société, faire dans la vie quotidienne ce que fait monsieur tout le monde. Comme vous le voyez sur le seul plan des barrières architecturales, la concertation est vitale. Si on y ajoute la question du transport, des soins particuliers, si on y ajoute le besoin de personnel spécialisé dans tous les secteurs d'activités que ce soit le loisir et le sport ou un autre, on s'aperçoit bien vite qu'on ne peut arriver à notre objectif ultime d'intégration sociale normale en s'occupant de notre petite affaire, de notre champ d'activité propre.

Si on persiste dans cette voie on fera ce que tout le monde a fait avant nous, soit la politique du pompier. Le nouveau gouvernement a adopté de nouvelles structures de travail avec ses ministres d'états qui ont un rôle de planification et de coordination des activités des différents ministères. C'est avec des problèmes de cette envergure que cette nouvelle structure subira ses véritables tests. Je pense fermement que ces nouveaux mécanismes susciteront cette concertation tant souhaitée dans ce domaine comme dans plusieurs autres d'ailleurs. Pour ma part, je crois fermement à la volonté du gouvernement dont je fais partie, d'aboutir à des politiques globales et intégrées. C'est ma ferme intention de travailler à ce que cela se réalise.

Durant ces trois jours, vous vous pencherez entre scientifiques sur les problèmes que doivent affronter les personnes handicapées sur le plan de l'activité physique. N'étant pas un spécialiste, je ne peux vous apporter de l'eau au moulin sur le plan de vos réflexions académiques et scientifiques. J'espère que cette rencontre sera extrêmement enrichissante pour vous sur le plan intellectuel. J'espère aussi et surtout qu'elle débouchera sur des projets concrets pour la population handicapée. Quant à moi, j'ai tenté comme homme politique et comme président d'honneur de cette rencontre importante, de me faire le porte-parole de centaines de citoyens qui attendent beaucoup de vous les scientifiques et qui attendent aussi beaucoup de nous, les hommes politiques qui assument le pouvoir. Il ne faut pas les décevoir. C'est un appel que je nous lance à nous tous.

Je vous remercie beaucoup.

ANNEXE II

CONFERENCE DE MONSIEUR DENIS LAZURE, MINISTRE DES AFFAIRES SOCIALES, GOUVERNEMENT DU QUEBEC

Conférence de monsieur Denis Lazure
Ministre des Affaires Sociales
Gouvernement du Québec

Chers amis de l'extérieur et de l'intérieur du Québec, il me fait plaisir ce matin de vous adresser quelques remarques, et de vous transmettre les salutations bien cordiales et les voeux de monsieur Lévesque et de notre gouvernement. Nous nous réjouissons de ce que votre premier congrès international soit tenu à Québec. Je vois que même nos météorologues vous ont réservé une fin de semaine tout à fait accueillante et ensoleillée.

Je veux, ce matin, vous transmettre brièvement certaines orientations du gouvernement actuel, surtout en ce qui concerne les personnes handicapées. La contribution que je veux apporter à ce congrès est une suite logique de celle que le ministère des Affaires Sociales a apportée dans sa préparation en fournissant le personnel de secrétariat, ici à Québec, depuis plusieurs mois.

Comme le disait il y a quelques instants monsieur Louis de G. Page, nous avons depuis un certain temps accordé, sur le plan des institutions psychiatriques, une importance tout à fait particulière à la rééducation physique. J'ai eu l'occasion, dans les institutions où j'ai travaillé en psychiatrie de l'enfance aussi bien qu'en psychiatrie de l'adulte, de favoriser l'intégration de l'activité physique. Ici, au Québec, c'est une notion relativement nouvelle.

Au Québec, l'activité physique a été confinée surtout aux activités scolaires et, évidemment, aux activités sportives. De plus en plus, les éducateurs physiques s'intègrent aux équipes multi-disciplinaires et ce, particulièrement dans le secteur de la psychiatrie. Aussi je voudrais, à titre de ministre des Affaires Sociales, rendre hommage à deux médecins qui ont contribué largement à améliorer l'état physique d'un grand nombre de personnes.

Je pense en particulier au docteur Gustave Gingras, qui tout récemment a pris sa retraite comme directeur de l'Institut de réhabilitation de Montréal. Il a, à plusieurs reprises, été appelé à aider certains pays étrangers à mettre sur pied des instituts de réhabilitation, de réadaptation.

Je veux rendre hommage aussi au docteur Dominique Bédard, de Québec, qui au début des années '60 a largement contribué à améliorer l'état des services psychiatriques à la population, et par conséquent, a ouvert certaines avenues à la présence des éducateurs physiques et des activités physiques dans la réhabilitation du malade mental.

Je sais que mon ami, monsieur Charron, le ministre qui est responsable du Haut-Commissariat des loisirs et des sports, vous a fait part de l'intention du gouvernement de présenter un projet de loi sur les personnes handicapées. Ce projet, qui sera présenté tout de suite après le congé de Pâques, a comme objectif principal de garantir le respect des droits des personnes handicapées.

Bien sûr, ces droits sont contenus dans la charte des droits de la personne que le Québec s'est donné il y a quelques années. Mais on pense qu'il y a lieu, par une loi spéciale, de mettre en relief les droits des personnes handicapées, car dans le passé cette minorité a été grandement oubliée. Autant quand il s'agissait d'aménagement des lieux physiques, l'accès aux édifices de toutes sortes, qu'en ce qui concernait l'ouverture à des programmes scolaires de préparation au travail.

Alors dans cette loi, nous voulons aussi promouvoir l'autonomie des personnes handicapées, et favoriser leur intégration à l'ensemble des activités de la vie normale de notre société, en particulier sur le marché du travail. A ce sujet, la loi va probablement prévoir la création d'un office des personnes handicapées, qui aura comme mandat de favoriser l'égalité de ces personnes. Notamment en les informant, en les représentant auprès des organismes publics, et en leur assurant que des services adéquats d'intégration professionnelle et sociale leur seront offerts.

Le mot en "s'assurant" est capital ici, puisque l'office n'aura pas dans tous les cas à développer lui-même tous ces services d'orientation sociale, occupationnelle, ou pédagogique. Dans certains cas, il devra le faire par voie de suppléance. Il devra surtout s'assurer que d'autres organismes, gouvernementaux ou non, qu'il s'agisse du ministère de l'Education, qu'il s'agisse d'un ministère de la Main-d'Oeuvre ou du Travail, ou évidemment, d'un ministère des Affaires Sociales, mettent à la disposition des personnes handicapées tous les services requis.

D'autre part, dans les semaines et les mois qui viennent, nous avons l'intention de mettre en marche certaines mesures qui peuvent paraître plus modestes, mais qui sont tout à fait urgentes.

Chez les enfants d'âge pré-scolaire particulièrement, nous avons l'intention d'ajouter une clause aux réglementations concernant les garderies, laquelle encouragera les garderies à admettre dans leurs rangs jusqu'à 25% d'enfants handicapés. Cette clause permettra évidemment aux garderies de recevoir des subventions plus généreuses, proportionnelles au pourcentage d'enfants handicapés intégrés à ces garderies régulières. Ici, je parle autant de garderies en milieu de travail, que de garderies dans les quartiers populaires.

Nous avons le choix, dans ce domaine-ci comme dans bien d'autres, et c'est un dilemme qui préoccupe sûrement plusieurs d'entre vous dans votre travail quotidien. Nous avons toujours ce choix, entre créer un réseau parallèle, un réseau soit disant spécial pour les jeunes enfants handicapés, dans le cas qui nous concerne, ou tenter d'intégrer dans le réseau régulier le pourcentage de ces jeunes enfants qui est retrouvé dans chaque section du territoire. C'est la deuxième option que nous choisissons.

Je pense qu'elle est beaucoup plus normalisante pour le jeune enfant. D'ailleurs, quant au ministère des Affaires Sociales, c'est une orientation que nous favorisons de plus en plus. Pour ouvrir une parenthèse, je donne un autre exemple.

C'est en ce qui concerne les soins aux malades chroniques et les personnes âgées, une population qui doit quand même vous intéresser, étant praticiens de l'activité physique. Plutôt que de créer de façon systématique des institutions pour malades chroniques, nous favorisons de plus en plus leur intégration au sein même des hôpitaux généraux.

Je pense que tout est dans le dosage que l'on fait de cette intégration. Bien sûr, elle doit être faite de façon graduelle bien souvent, parce que l'on rencontre chez les professionnels de la santé, comme chez bien des gens, une espèce de rejet. Ou tout au moins un manque d'intérêt, un manque de motivation pour le travail auprès des personnes âgées aussi bien que des malades chroniques.

Donc, l'intégration au niveau du réseau des garderies est une des priorités du gouvernement actuel. A l'intérieur du programme du parti, nous avons toujours pris l'engagement de multiplier de façon importante le nombre de places de garderies. Dans l'année fiscale qui va commencer au mois d'avril, nous espérons obtenir les crédits qui nous permettront de doubler le nombre de places subventionnées dans les garderies du Québec.

On est bien conscient que ceci demeure très modeste. Actuellement, il y a à peine 3,000 places de garderies subventionnées dans tout le Québec. Il y a un retard considérable à combler, et aussi dans les autres projets à court terme qui retiennent actuellement notre attention. Projets qui vont aussi retenir les budgets, au niveau des adultes, dans le cadre de cette loi qui nous l'espérons pourra être adoptée dans les mois qui viennent. De plus, nous avons l'intention d'affecter des sommes importantes au développement des ateliers protégés.

L'office des handicapés aura entre autres tâches, surtout au début il faudra que l'office joue un rôle de suppléance, comme je le disais plus tôt, de s'assurer que le Québec soit enfin doté d'un réseau acceptable d'ateliers protégés. Il y a aussi à l'intérieur de ce projet de loi une clause qui demandera aux entreprises, probablement celles ayant au-delà d'une cinquantaine d'employés, et ceci se fait dans un bon nombre de pays au monde, de réserver un pourcentage d'emploi pour les handicapés physiques et mentaux, probablement autour de 2%.

Nous avons aussi de façon temporaire accepté depuis quelque temps, en attendant des dispositions plus statutaires, de subventionner des entreprises de transport pour personnes handicapées. Nous sommes conscients qu'il s'agit là de solutions temporaires. Notre objectif est de faire en sorte que les systèmes de transport public, et le titulaire du ministère des Transports du Québec est parfaitement d'accord avec cette orientation, assumeront dans un avenir assez rapproché la responsabilité d'offrir des services de transport à toutes les personnes handicapées. Et non pas de compter sur des subventions au bon vouloir des gouvernants pour permettre aux handicapés de se déplacer, que ce soit pour aller aux études ou au travail.

Nous voulons aussi augmenter les services de jour dans le secteur de population de personnes âgées. Comme dans bien des pays la solution, un peu traditionnelle, pour le soin des personnes âgées était l'hospice, ou le centre d'accueil, nous désirons multiplier les centres de jour ainsi que les services à domicile.

Les personnes âgées trop souvent, que ce soit dans les hôpitaux ou les familles d'accueil, souffrent d'inactivité physique de façon tout à fait flagrante. Et c'est une nombreuse population qui a vraiment besoin d'activité physique. C'est la plainte, le problème qu'on nous soumet quand on visite des établissements.

Je voudrais dire quelques mots en terminant sur l'importance de l'intégration du praticien de l'activité physique. Je n'ose pas limiter cette pratique à l'éducateur physique, bien que plus souvent qu'autrement c'est lui qui détient la compétence la plus appropriée. Mais je voudrais insister sur l'importance de son intégration à l'équipe multidisciplinaire d'une part, et d'autre part à l'importance pour l'éducateur physique de transmettre son savoir à d'autres membres de l'équipe.

Je pense qu'il faut éviter le piège du professionnalisme à outrance dans ce domaine-ci comme dans bien d'autres. Il serait utopique de vouloir confier seulement à des éducateurs physiques universitaires ou collégiaux la responsabilité et la mise en marche de programmes d'activité physique. Et je crois qu'il y a lieu d'intensifier des programmes par lesquels l'éducateur physique va initier d'autre personnel dans l'équipe, du personnel au départ avec moins de formation et ayant moins de préparation intellectuelle. Je pense au cadre hospitalier, les préposés aux malades et les animateurs, de sorte que la transmission de ces techniques puisse ensuite assurer la distribution des soins ou de ces techniques à un nombre beaucoup plus grand de sujets, qu'ils soient des enfants ou des adultes.

Il m'apparaît important de faire cette mise en garde, d'autant plus que votre profession est assez jeune, elle n'a pas encore établi des rituels qu'on retrouve souvent dans d'autres professions, qui font que des ouvertures d'esprit vers d'autres disciplines deviennent extrêmement difficiles. Alors par définition, les professionnels ou les praticiens de l'activité physique sont des gens extrêmement dynamiques, énergiques et pleins d'initiative.

En terminant, je veux les encourager fortement à jouer un rôle de leadership dans ce que j'appellerais une éducation permanente du personnel qui les entoure, et non pas de structurer leur travail quotidien en fonction d'une activité dirigée à la personne ou aux personnes qui reçoivent l'enseignement dans le cadre de l'éducation physique.

Je regrette de ne pas avoir pu participer à vos séances, je reconnais plusieurs figures ici dans le groupe, et je suis conscient de l'importance de plusieurs communications. J'ai eu l'occasion de regarder le programme que vous aviez préparé pour ce congrès, et je vous souhaite que les délibérations vous apportent tous les fruits désirés. Pour ceux de l'extérieur, je souhaite que votre séjour soit rempli de bons souvenirs. A tous j'offre mes meilleurs voeux pour que dans les recherches que vous faites, aussi bien que dans votre pratique de tous les jours, et là on rejoint un peu le rôle qu'on m'a confié depuis quelques mois, vous puissiez garder une préoccupation sociale.

Je pense que les responsables des activités physiques devraient peut-être, au moins pour une certaine période de rattrapage, concentrer leurs activités sur toute cette portion de notre population qui a été largement oubliée: les handicapés physiques et les handicapés mentaux. Je vous remercie.

ANNEXE III

CONFERENCE DE MONSIEUR ROBIN HINDLEY SMITH DE L'ORGANISATION MONDIALE DE LA SANTE

W.H.O. policy in disability prevention and rehabilitation

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Health, in the last analysis, is being able to enjoy a life similar to your peers. It is to be able to move independently, to be free from sensations of pain or of disability and to be able to react normally to normal mental stimuli.

Any limitation of normal movement, of vision, speech, hearing or mental activity can make the existing environment more difficult to live in and it is the purpose of rehabilitation services to improve both the person so affected and his environment in order to make his life more acceptable.

Traditionally rehabilitation has been associated with increasingly sophisticated methods of restoring motor activity or sensation. Sophisticated prostheses have been developed to duplicate human anatomy and physiology and complicated mechanical devices invented to improve independence. These methods may be very effective when they are accessible but often they imply that the disabled person has the means to acquire them or that he can live in the very special environment of a rehabilitation center or a house especially designed for his needs.

Most disabled people cannot aspire to this degree of assistance and for some years health authorities in general and the World Health Organization in particular have been disturbed by the fact that whereas in the past 30 years much investigation has been done in the provision of sophisticated services to the physically disabled, not very much has been done about the possibility of providing simple, but efficient and opportune, services to patients in their own homes or at the primary health care level.

The "real" problems of any given disabled person will, of course, vary very much with his personality, his economic status, and where he lives; but in many of the smaller towns and villages of the developing world, the way of life tends to be relatively unsophisticated. Although there will be many differences in detail it may well be found that a number of the problems encountered can be, if not solved, at least "alleviated" by simple activities. It should be noted that by "activities" is included anything which may be of help, from simple exercises or activities of daily living to providing contact with a person such as a social worker.

Since it is obviously economically and geographically impossible to provide first class rehabilitation services to 100% of the world's disabled population, it has become recognized that, although there will be some people in most countries who will be able to take advantage of advanced techniques (and others who cannot survive without them), investment should also be made in providing "appropriate" services in or close to the patients' homes.

As I said, the World Health Organization and its member states have been concerned about this situation and last May at the 29th World Health Assembly the delegates made the following recommendations to the Director General: (Document WHA29.68 in Annex I).

Now what do these recommendations mean exactly, what effect are they likely to have on the activities of the World Health Organization and what influence may they have on the health policies of member states?

Basically, they mean that countries are being encouraged to include services of disability prevention and rehabilitation in their national health care programs. Countries, naturally are under no obligation to follow this suggestion but more and more are, in fact, tending to do so. If they do elect to establish such services, then again they may or may not want the cooperation of WHO in doing sc. However if the WHO is asked to assist in this field, the new recommendations oblige WHO consultants to try to encourage health authorities to sponsor activities that do not apply only to hospitals or rehabilitation centers but also to simple techniques which can be given at the community level.

As you know, traditional rehabilitation services have been given by multi-disciplinary teams often concising of doctors, rehabilitation nurses, physical and occupational therapists, speech therapists, prosthetists, social workers, psychologists and vocational counsellors and trainers all working in sophisticated surroundings. No one is denying that this approach works. Often it works very well. But the cost of providing the type of assistance is such that it does not reach and never will reach any but a minute fraction of the 400 million disabled needing some kind of assistance.

It is totally unrealistic to believe that the world will ever be able to afford enough doctors and therapists to cover its needs. This is why WHO has been asked to give priority to investigating and implementing simpler and less costly solutions. No one is pretending that these services will be perfect or as good as those that a fortunate few are now receiving but they will be a lot better than nothing - and nothing is exactly what about 75% of the world's disabled are receiving today.

One must also consider that in terms of general policy WHO has committed itself "to assist in meeting the needs of those hundred of millions of people who have no access to sophisticated health care". The overiding motive of WHO involvement - in the sense described here - is humanitarian and directed toward the underprivileged populations and this will remain so.

What sort of services do we have in mind? (Document A29/INF.DOC/1 in Annex 2).

First we are concerned with taking measures which are aimed at preventing the causes of functional limitation.

We can hope and expect that in time these activities may lessen the number of people with functional limitations but naturally, in the forseeable future, large numbers will continue to occur.

Once the functional limitation has stated to develop we must try as early as possible to limit its development and, where possible, to reverse it. Once we arrive at the stage where the functional limitation is permanent then we have to teach the patient how best to live with it.

During the last 20 years or so most of our time and energy in rehabilitation has been spent trying to solve the problems of the patient who arrives at a sophisticated facility with an already fixed functional limitation - the person we see in the physical medicine department of a hospital or rehabilitation center.

The policy that we are now discussing has two main thrusts. First to try and prevent the functional limitation from occurring and secondly, if it does occur, to do all that we can at the community level to make his life acceptable. This approach is of course essential in countries where no other facilities exist but it can be valuable in developed countries as well because the limited sophisticated facilities that do exist can be reserved for those patients for whom they are essential. (Some examples of these simpler techniques are presented at the Annexe 2).

ANNEX 1

WHA29.68-20 May 1976

Disability prevention and rehabilitation

The Twenty-ninth World Health Assembly

Recalling resolution WHA19.37;[1]

Having considered the report of the Director-General on disability prevention and rehabilitation;[2]

Having considered the great medical, economic, social and psychological impact caused by disability to millions of people throughout the world;

Recognizing that the existing services are costly and the coverage inadequate, and that an extension of the present pattern of services is unlikely to meet the needs of most countries;

1. THANKS the Director-General for his report;

2. RECOMMENDS that the WHO policy on disability prevention and rehabilitation be oriented to:

(1) the promotion of effective measures for the prevention of disability;

(2) the encouragement of the application of effective approaches and appropriate technologies to prevent disability while integrating disability prevention and rehabilitation into health programmes at all levels including into primary health care;

(3) emphasis on those problems of disability that can be solved most efficiently and effectively and in a manner acceptable to the populations; and

(4) the inclusion of the appropriate disability prevention and rehabilitation methods into the training of all relevant health manpower;

3. DRAWS THE ATTENTION of Member States to the importance of disability prevention and rehabilitation as an integral part of health and social services and to the need for collaboration between all agencies concerned with health promotion, including social welfare services;

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[1] WHO Handbook of Resolutions and Decisions, Vol. 1, 1973, p. 34.

[2] Document A29/24.

4. REQUESTS the Director-General:

(a) to encourage the application of these new policies; and

(b) to seek the cooperation of other organizations of the United Nations system and of nongovernmental organizations in their implementation.

Thirteenth plenary meeting, 20 May 1976
A29/VR/13

ANNEX 2

A29/INF.Doc/1

Chapter 6: Prevention of disability

In the past, rehabilitation has usually been described as the third phase of medicine, with prevention and curative care respectively the first and second phases. This attitude has disassociated rehabilitation from the preventive area and also, to some extent, from the area of curative care. Thus, experiences in rehabilitation have rarely been utilized to plan adequately for the future. Prevention depends on our ability to understand the causes of disability so that the prevention of disability can be developed through scientific means. This also requires a political process, a commitment to change from one type of service to another. For disability prevention the priority need is not to extend rehabilitation services; what is required is a change of focus from the type of delayed intervention that has characterized rehabilitation in the past to a strategy of earlier intervention so that the incidence of problems in this area may be reduced. As defined in Chapter 1, the prevention of disability calls for interventions at different levels, for which the terms "first-level prevention", "second-level prevention" and "third-level prevention" will be used.

Our present technologies to deal with disability prevention will be reviewed below. The description does not aim at giving a full account of all the available preventive resources, but rather at giving examples of the possible interventions, which need to be strengthened within and outside the health sector in order to reduce the incidence and impact of disability. This will be followed by a discussion of the possible overall strategy in this area.

It should be stated that there are already many programmes in the area, operated by national or international agencies, many of which have been or are at present being assisted by WHO.

6.1 First-level prevention

Impairments can be prevented to a certain extent and the main strategies involved in such preventions are discussed below. Some examples of preventive measures are given in Table 2.

6.1.1 Prevention of congenital disease

These preventions concern genetic and non-genetic disorders. Genetic disorders are frequently seen in developing countries, where cultural patterns encourage intermarriages, especially in isolated rural areas. Wherever possible, prospective counselling should be used to influence such cultural factors, especially when high-risk families or communities are identified.

Table 2. Some first-level prevention measures

Problem	Measures	Agents for preventive action
Communicable disease	Vaccination, proper water and sewage systems, hygiene education	Primary health care Public works Health authorities
Road accidents	Legislation, inspection of cars, traffic regulations, etc., education in traffic behaviour	Traffic authorities Community school teachers
Home accidents	Community education and improvement of home installations and housing	Legislation Community leaders Teachers
Work accidents and occupational diseases	Legislation and law enforcement, engineering measures, health control of workers, monitoring of accidents and environmental hazards, safety committees	Occupational health authorities, management, labour organizations
Alcohol and drug abuse	Legislation and law enforcement to decrease availability, restrictions, attitude changes, etc.	Health authorities Community leaders Social welfare
Nutrition	Changes in farming outputs, improved distribution and information, control of gastrointestinal infections, supplementary feeding legislation	Agricultural authorities Health sector

Table 2. Some first-level prevention measures (continued)

Problem	Measures	Agents for preventive action
Burns	Redesign of cooking stoves, use of less dangerous fuel	Community leaders
Traumatic lesions following falls from trees	Construction of safety belts to be used when climbing trees	Community leaders
Complication of pregnancy and birth	Full coverage of pregnant women by maternal and child services, legislation, education, attitude changes, etc.	Local and central health authorities, community leaders

Retrospective counselling (i.e., contraception, pregnancy termination, sterilization, artificial insemination, etc.) is the recommended method for preventing the recurrence of a genetic disorder. As, however, there may be economic, cultural, and religious barriers to these measures, many obstacles have to be overcome before such preventive techniques can be more widely applied.

It is believed that preventive measures may reduce the incidence sharply of some of the impairments caused by genetic factors, e.g., the incidence of mongolism could be reduced by about 50% through a programme of prenatal screening of the pregnancies that occur in women over 35 years of age (i.e., about 10% of all pregnancies), with selective termination where indicated. It has been calculated that the costs of such a programme in a developed country are very small compared with the costs for the care of a mongoloid person throughout his life. In most developing countries, however, such interventions are not economically feasible at the present time.

Non-genetic, congenital disorders are usually related to malnutrition and communicable disease in pregnant mothers, or to low-quality midwifery. The influence of malnutrition and communicable disease will be dealt with below. Low-quality midwifery can be improved by training the traditional birth attendants, by the introduction of properly educated midwives, and by changes in the people's attitude which impedes the midwife's work. Improved perinatal care is of great importance to decrease impairment incurred at an early age.

6.1.2 Prevention of communicable disease

Such prevention includes vaccination, community health education programmes directed towards improvement of personal hygiene, provision of proper water and sanitation facilities, interventions to contact biological vectors, etc. Such measures could eliminate most of the related disability, but progress in this area has not been as rapid as desired because there are many differences involved, such as a lack of technology and properly trained manpower, cultural and religious barriers, illiteracy, ignorance, etc.

6.1.3 Prevention of noncommunicable genetic disease

It is believed that among other factors, physical overload, malnutrition including vitamin deficiencies, communicable diseases, and alcoholism contribute to disturbances in the locomotor system. Tobacco smoking, inappropriate diet, and lack of physical exercise seem to contribute to cardiovascular disease. Exposure to a multitude of allergens, to air pollution, and other hazards (silica, asbestos) contribute to bronchial asthma and other chronic non-specific lung diseases. Malignant diseases may also be related to environmental factors, of which only a few are at present well identified. Dental lesions are related to inappropriate diet, vitamin deficiency, lack of oral hygiene, etc.

There is no lack of research into the effective technologies related to the prevention of noncommunicable disease. The available data are, however, differently interpreted by experts. Because noncommunicable somatic diseases are expected to be a major contributor to disability in the future in both developed and developing countries, increased efforts are needed to achieve better prevention in this area.

6.1.4 Prevention of functional psychiatric disturbances, alcoholism, and drug abuse

The mental health professions have in the past insufficiently recognized the need for impairment prevention. Scientific knowledge concerning primary causes in conspicuously lacking, although social factors such as urbanization, housing problems, family disturbances, unemployment, lack of social opportunities, and negative community attitudes contribute to the severity of the problem. It is not yet very clear how one might use this knowledge to decrease the occurence of impairment.

Alcoholism and drug abuse alone seem to be closely related to people's attitudes and behaviour, to the availability and price of liquor and drugs, to legislation and the enforcement of laws related to the drug market, and to family disturbances, urbanization, etc. Many interventions have been seen to be successful but public education is needed to increase their acceptability.

6.1.5 Prevention of accidents

The prevention of road traffic accidents is an area that has received increasing interest in the developed countries of the world during the last two decades. It has been known that legislation aimed at improving the safety of motor vehicles, forbidding driving under the influence of alcohol, lowering the speed limits, and other means to increase safety for both car-drivers and pedestrians have had at least a moderately good effect on the incidence of road accidents. Attempts to identify "accident-prone" individuals have not yet produced any definite results, although it is well known that young, male drivers constitute a high-risk group.

In many countries legislation aimed at the prevention of industrial accidents has proved rewarding. Such accidents are usually due to unfamiliarity with the type of work and a lack of safety measures on machinery. Better vocational education and the enforcement of adopted legislation may improve this type of prevention. In developing countries a majority of work accidents relate to agriculture and stock-raising, and here better safety measures could be achieved through public education.

Some accidents, resulting in burns, fractures, etc., can to some extent be prevented by the use of safer home installations, better building codes, and the education of children and adults; present efforts should therefore be increased.

Accidents from the misuse of firearms and other weapons may be decreased through enforcement of tougher legislation and better control of the sale of arms.

6.1.6 Prevention of malnutrition

Malnutrition is a complex problem and its prevention requires a coordinated multi-sectoral approach. The production and availability of an adequate quantity and quality of food is an important measure for the control and prevention of malnutrition but is not a sufficient condition for nutritional improvement. Health measures, like the control of infections and parasitism and the improvement of environmental sanitation, increase the biological utilization of food and reduce the nutritional vulnerability of man. Supplementary feeding programmes for the nutritional protection of the most vulnerable group of the population is an important step in intervention. Again, the incidence of severe nutritional deficiencies with highly disabling effects, such as in endemic goitre, cretinism, and xerophthalmia, cannot be significantly reduced by simple dietary improvement. Nutritional interventions, like salt and food fortification and enrichment, are essential for the control and prevention of such deficiencies. Mass prophylaxis with twice yearly oral dosing with vitamin A can reduce the incidence of xerophthalmia to an insignificant level. It is obvious that most of these measures are the responsibility of the health sector. If the existing constraints in the form of a lack of infrastructures and personnel are overcome and a satisfactory and simple delivery system is evolved with a much broader coverage, the problem of malnutrition will be very significantly reduced.

6.1.7 Other causes

Among other specific causes, chemical intoxications and exposure to occupational hazards play a significant role. These are often due to exposure in industrial work and farming, or to food poisoning. Improved occupational health measures and public education, as well as legislation introduced to promote strict monitoring of the level of industrial toxic substances, etc. should be used to prevent such intoxications.

6.1.8 Estimations of the effect of first-level (impairment) prevention

It is obvious that our present knowledge of effective first-level prevention is uneven. In the areas of communicable disease and malnutrition there are sufficient techniques to eradicate most of the resultant disability or about one third of all disability. The prevention of accidents, intoxication, occupational diseases, and congenital disease are areas under development, because the means to reduce the problems exist. In two main areas, noncommunicable somatic disease and mental health disorders (functional psychiatric disturbances, alcoholism and drug abuse), there is insufficient knowledge of how impairments may be prevented. Thus, promotion of research in these areas must be encouraged.

It is clear, however, that even when effective measures are available, there are other obstacles in the way of first-level prevention. Poverty, ignorance, lack of logistics, and cultural and religious factors are of great importance, but even when these barriers are not present, public acceptance (e.g., in the case of tobacco smoking) might prove too difficult to achieve.

It must also be realized that unless better means are found to prevent noncommunicable somatic disease and mental health disorders, the proportion of disabled persons in all populations will probably increase in the future despite the expected better health situation. This is (as indicated in Chapter 2) due to the present very high rate of mortality of impaired and disabled children in developing countries.

6.2 Second-level prevention

When an impairment has appeared, it is necessary to try to prevent any long-term functional limitation from occurring and to do so requires measures specifically in three areas (for example, see Table 3):

1. ability to identify those impairments that might lead to such limitations;
2. proper care of impairments in the acute stage to avoid subsequent limitations;
3. proper care of impairments in the chronic stage or recurrent impairments to avoid limitations.

Examples of what one might achieve through second-level prevention are given below

6.2.1 Development of diagnostic ability

These might include the ability to recognize a person with mental retardation, to make a simple test of visual and auditory acuity, or to diagnose leprosy, tuberculosis, a fracture, psychosis, etc.

6.2.2 Care of acute cases

These might include the skills to administer proper first-aid, to splint an arm fracture and advise on suitable exercise during the treatment of a fracture, to sterilize or avoid infection of wounds, to manage an acutely excited patient or one with an epileptic fit, etc.

6.2.3 Care of chronic cases or recurrent impairments

These might include the provision of drugs and injections, e.g., to patients with epilepsy, psychosis, leprosy, trachoma, tuberculosis, hypertension, diabetes, etc.

6.2.4 Estimation of the effects of primary prevention of disability

The effects of the means suggested above are to some extent known, e.g., the treatment of epilepsy, hypertension, fractures and psychosis may be effective. It seems probable that rewarding results could be achieved. To further demonstrate and evaluate such effects should be one of the objectives of this programme.

6.3 Third-level prevention

When a long-term functional somatic or mental limitation has developed, one might institute measures aimed at the prevention of disability. Such measures may be divided into medical, social, vocational, educational, etc. This division should not be a restraint to their total coordination in terms of planning, arrangement of priorities and use of manpower.

Besides systematic medical treatment to postpone as long as possible the disability which may result from long-term functional limitation, third-level disability prevention measures include (see also Table 3):

1. Training to increase independence in self-care.
2. Educational and vocational measures aimed at achieving economic independence.
3. Social measures to ensure full integration and acceptance in the community.

Examples of such measures are given below.

6.3.1 Technologies given priority in this programme, aimed at the provision of care at community levels with a low cost/benefit ratio

6.3.1.1 Independence in self-care

Within this group of measures falls the training and teaching of patients or family members, neighbours, etc. Independent self-care calls for independence in:

(i) activities related to daily life such as dressing, eating, drinking, washing, personal hygiene, etc. They require mainly training activities and sometimes the provision of simple technical aids;

(ii) mobility, sitting, standing, walking, etc. They require the provision of simple devices: shoes and crutches, training of blind-conductors;

(iii) accomodation that is suited to the kind of functional limitation.

2.3.1.2 Economic independence

One must consider here the widespread illiteracy and lack of employment opportunities in most rural developing areas. All measures should be consistent with the present national policies and priorities. Thus, although it may be advocated that educational and vocational training facilities should be seen as a priority for those with severe functional limitations, it seems advisable to consider such facilities in relation to those offered to the able-bodied population. The principal task should be to reduce the differences in the opportunities available to disadvantaged and disabled people compared with those available to the able-bodied population.

All schooling and vocational training of persons with functional limitations should, where at all possible, be given within normal facilities and not at special institutions. The creation of the latter contributes to segregation.

Active measures have to be taken to avoid the widespread exclusion of disabled persons from school and employment (especially those with externally visible impairments).

When economic independence is not possible there should be arrangements for contributions to be made within the family or from the community.

6.3.1.3 Social integration

The social segregation of disabled persons is extremely widespread. It affects not only persons with communicable diseases (such as tuberculosis or leprosy), but also persons with visible defects (such as a missing eye, nose, or arm, kyphoscoliosis, etc.) and those with mental retardation, psychosis, epilepsy, etc. Mostly this reflects deeply rooted fears and beliefs, originating frequently from ethnic and religious traditions which are often inherent in the cultural structure. Medical practice in the past has sometimes reinforced these attitudes of segregation and confinement, e.g., in providing mental hospitals, leprosy colonies, epilepsy colonies, and other closed institutions for the disabled.

Disability prevention does not seem to be feasible unless effective methods are developed to bring about a change in such attitudes. It must be emphasized that these social barriers seem to be as widespread in the developed as in the developing countries. For this type of prevention one must use both individual and collective means. Family members and neighbours must be persuaded to help in the social integration of disabled children and adults. Mass-media programmes, e.g., radio and television, should be coordinated with community-based intervention facilities. Teachers, and political and religious leaders can also contribute to produce a change in attitudes.

6.3.1.4 Estimation of the effects of third-level disability prevention

The effects of the interventions mentioned are not known to any great extent. One of the aims of this programme is to evaluate the results of third-level prevention. It is necessary to indicate that all disability problems may not be solved by the means described here. Chronic conditions may develop in a way that demolishes all improvements, and effective solutions are not at the present time available for many of the problems.

It is also necessary to mention that there is a degree of self-rehabilitation. Disabled patients may sometimes by themselves, or with the aid of their families or employers, solve their problems without any external aid. The fact that disability is so widespread and self-rehabilitation so difficult to achieve in many societies indicates that this area should, if given the proper facilities, be a rewarding one.

The measures indicated above are given priority in this programme because of their orientation towards community-based facilities and their use of low-cost technology.

6.3.2 Other solutions, mainly dependent on highly developed institutional services

Table 3 also lists several examples of solutions to problems in the disability area that should not be given priority in the context of developing countries (listed under section (b) in the Table). These depend mainly on the development of institutional services with access to specialized professionals and high-cost advanced technology.

The creation of such institutional facilities should not be encouraged at the present phase of development in the emerging countries.

6.4 The strategy of disability prevention

As may be concluded from the above, disability prevention is not a new area or a new speciality. To prevent disability is the responsibility of all health personnel and also of staff outside the health area.

The choice between different approaches is not an easy one. But seen as a strategy to diminish the impact of disability, one should on a long-term basis try to give priority to the approaches that have the best cost/effectiveness ratio. Some examples of the change of orientation are given below, e.g., one should:

- extend vaccination against poliomyelitis rather than extending rehabilitation services for those already crippled by polio;
- invest funds in prevention of blindness rather than extending special education and sheltered workshops for the blind;
- provide simple drugs for epileptics and the mentally disturbed in their homes rather than build institutions to care for them;
- provide safety measures to prevent traffic, home and occupational accidents rather than extending institutional care for the victims;
- teach simple interventions and technology to family members of patients with functional limitations instead of referring them for treatment at far-away hospitals.

- change agriculture technology to make it more suitable for those with functional limitations rather than provide for invalidity pensions or "welfare".

When such and similar means fail, there will be a need for rehabilitation. The new orientation towards prevention of disability therefore does not imply the suppression of ongoing rehabilitation services, for which there are at present no better alternatives. With present technology, at least 50% of all disability may, however, be prevented or postponed. For those conditions where the proper means and technology are lacking, research must be promoted.

Guidelines for the creation of a reoriented system for providing the necessary services will be given in the next chapter.

Table 3. List of examples of problems and solutions related to second- and third-level prevention

Problem	Solution
Amputation below knee	(a) Simple leg made in the community (with local materials, e.g., wood, rubber, leather) (b) Modern artificial limb made in a prosthetic workshop
Amputation above knee	(a) Pylons (jointed simple prosthesis) Crutches made locally (b) Modern artifical limb made in a prosthetic workshop
Mental retardation	(a) Education of mothers in training retarded children in self-care; later, arrangement of suitable jobs within the family or in the community (b) institutional care, sheltered work

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(a) indicates solutions given priority and falling within the responsibility of a community-based care system in the settings of developing rural areas

(b) indicates the solutions not given priority because of high costs or the degree of technical refinement in such settings.

Problem	Solution
Poliomyelitis sequelae and other paralysis	(a) Orthoses made locally, community help with transportation, local schooling, arrangement of suitable job within family or community
	(b) Special orthoses, wheelchair, institutional schooling and care, sheltered work, special units for paraplegics and tetraplegics, electronic aids
Epilepsy	(a) Provide simple, inexpensive anticonvulsive therapy in the community. Refer severe cases to next level of care. Arrange suitable job.
	(b) Examination, including EEG, by specialist. Institutional care.
Psychosis	(a) Provide long-term, inexpensive drug treatment locally after advice by psychiatric nurse or physician, refer severe cases to next level of care. Arrange suitable job. Supervision and support of patients' family
	(b) Institutional care
Malnutrition	(a) Education in nutrition, especially of mothers, in the community, treatment of gastrointestinal infections, referral of severe cases to next level of medical care
	(b) Referral of all mothers and children to specialized facilities
Community attitudes to the disabled	(a) Education, information and propaganda aimed at changes in public attitudes, to increase acceptance and diminish social distance

Problem	Solution
Deafness	(a) Advice to parents and/or teachers on how to train children in self-care and communication; provision of jobs within the family or community (b) Provision of hearing aids, special schooling, institutional care, speech therapy
Blindness	(a) Advice to parents and/or teachers on how to train children in self-care and how to move about in the neighbourhood; arrangement of blind conductors and of suitable jobs within the family or community (b) Provision of special schooling, institutional care, electronic aids
Arm fracture	(a) Closed fracture without dislocation splintered locally, open fracture or one with dislocation referred to next level of care (b) Referral to orthopaedic specialist
Leg fracture	(a) Referral to local hospital, after-care in the community (b) Referral to an orthopaedic specialist
Cerebral palsy, other chronic neurological disease (paralysis excepted, see under poliomyelitis)	(a) Parents advised to train child in self-care activities, community economic aid (in kind) if necessary (b) Institutional training by physiotherapy, speech therapy, special schooling, special hospital units for multiple sclerosis

Problem	Solution
Disabled person's acceptance of own disability	(a) Education and information aimed at attitude change.